A FACTOR-ANALYTIC STUDY OF MUSICAL ABILITIES OF EGYPTIAN STUDENTS TAKING MUSIC AS A SPECIAL SUBJECT

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by

Amal Ahmed Mokhtar Sadek
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To

My Daughter

ABSTRACT

The present investigation was carried out to determine the nature of musical ability and its measurement with a population of Arab-background. An historical account of music in Ancient Egypt and of its development to modern times is included. Two different test batteries have been applied to four different groups numbered III, 74, 171 and 60 subjects respectively. The first two groups aged between 9+ to 15+ and the last two aged between 16 to 21+. From these four groups, group 2 and 4 are highly selected.

The batteries included types of different test based on different theories of the psychology of music in order to have, as far as possible all the aspects covered.

It was found that, in the children's groups, boys did better than girls, but no appreciable sex differences in the adult groups were found. Also it seems that musical ability tends to run in families, indicating that it depends on innate components though also helped by family environment. The influence of "g" is likely to exist, but not to a great extent.

In all the four factorial analyses, a general musical ability factor has been indentified which are counted for the greatest share of the total variance of the variables. Other group factors separated the tests according to their nature. One of the factors identified in the selected group is a Western Vs.Oriental factor where preferences and test materials were contrasted.

One of the important findings is that oriental subjects do even better in certain tests than occidentals but proved to be handicapped if the harmonic structure of music is involved.

And finally, some of the newly constructed tests seemed to be promising as indicated by their reliability, validity and the regression analysis, and hence could be used in selecting those who wish to specialise in music.

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CHAPTER I

Historical Background of the Nature of Egyptian Music

It should be pointed out that this Introductory Chapter is not psychological, though it is relevant to the main thesis in bringing out the differences between music in Egypt and western music. The educational-psychological study begins in Chapter II.

Music is a universal language which is used to express ideas, emotions and moods, and accordingly will arouse corresponding reactions. Within every culture, this art will differ according to its nature and customs. As with any other concept, the origin and development of such an art is established through historical studies.

In the case of Egyptian music "all early musical investigations regarded the Egyptians as an unmusical people - an opinion with which we even meet in the present century. Such a belief was especially fostered by a misunderstood passage of Diodorus Siculus. It was only after Dr.Burney found a hieroglyph in the shape of a lute on a fallen obelisk at Rome, and James Bruce discovered representations of harps in the tombs of the Kings of Thebes that this illusion began to be dispelled. The false impression was still further weakened by the discovery of the monuments which threw new light upon the musical condition of the mysterious land of the Nile". (Emil Neumann, 1882).

The history of Ancient Egyptian goes back as far as 4000 years B.C. This period can be divided according to different Pharoahs who ruled Egypt and can also be divided into three major periods known as

(1) The Old Kingdom

(2) The Middle Kingdom (about 2000 B.C.)

(3) The New Kingdom (about 1550 B.C.)

Those who study the history of these periods can easily find evidence to confirm their views of a development or a decline in civilization.

It is commonly accepted in history that when Greece was only on the threshold of its civilization, the Egyptian Twelfth Dynasty was ruling a well-developed country that "enjoyed a musical culture". It is an historical fact that musical activity in Ancient Egypt goes as far back as the Fourth and Fifth Dynasties. (4000 - 3500) B.C. but as Pulver (1921) pointed out "the music made then, and the instruments upon which it was made, could not have been a result of a sudden inspiration and invention" (P.29.) Further evidence was given by Wilkinson (1878) when he said:-

> "How far, then do we find Egyptians surpassed the Greeks at this early period in the science of music? Indeed, long before the lyre was known in Greece, the Egyptians had obtained the highest degree of perfection in the form of their stringed instruments; on which no improvement was found necessary, even at a time when their skill was so great, that Greek sages visited Egypt to study music, among other sciences. for which it was renowned".

The Ancient Egyptian's belief that the dead person will be resurrected led them to the idea of putting everything which belonged to him during his life in his tomb with him. These ancients also left pictorial representations of everything they did and everything they used in these tombs and their temples. These paintings and belongings have provided the main data regarding their civilization and also facilitated the carrying out of historical researches.

Music, in Ancient Egypt, like other arts in most Ancient Nations, was predominantely sacred. However, it soon came to be practiced in almost every phase of social and religious life. Hence, the music of Ancient Egypt may be roughly divided into two main classes, religious and secular with their various sub-divisions.

Sacred Music:-

Representations of the religious processions found in the temples showed the important connection which existed between music and religion. In their temples "solemn ceremonials took place daily; the priests chanted in praise and supplication of their numerous gods". (Robertson and Stevens 1960). Among these ceremonies is the "Songs of Isis and Nephthys". The poem used in this ceremony suggest that "the music took the form of alternate duets between two priestess and solos by the priestess representing the goddess Isis with a hymn to the god Osiris sung by a male precenter in the middle ceremony", (Ibid). One of their beliefs is that the God Thoth was the originator of the lyre (stringed instrument), and they attributed the origin of the sacred melodies to the goddess Isis.

Music was regarded as an important science, which should be studied and cultivated by the priests. They also placed their music in close affinity to astronomy, a position which seemed to exist among the Chinese, Hindus and the Greeks. "This linking together of music with the science of the stars and the Universe distinctively points to their view of music as the art capable above all others of giving complete expression to the infinite, the eternal and the ineffable." (Neumann 1882 P.38).

Secular Music

Under this heading comes the music which was practiced in the courts, dance music, songs, ceremonial music of the state and public festivals, the pastoral songs of the herdsman and the tiller of the soil, the songs of the boatman, the martial music of the soldiers, and minstrelsy of the wondering bards.

The practice of secular music was presented as paintings on the walls of the temples and tombs. "In the 4th dynasty of the Old Empire we find a chorus of female singers associated with a performer of the harp and also men accompanying music with mimicry ..... the musical conductor of this whole group is in the act of holding the palm of his ear as if desiring by this means to increase the power of his hearing". (Neumann, 1882 P.47).

By the time of the 12th dynasty a highly developed musical culture existed. As civilization does not grow up suddenly, so the art which existed must have been preceded by a long period of anterior development. "Even times of decadence must be reckoned with, and so we must suppose that the birth of Egyptian culture took place at a period that is lost in the mists of the past whose remoteness the modern mind can barely realize". (Pulver, 1921).

From a wall painting of Catacombs dating from the 17th dynasty, there is a representation of one of those private orchestras which was usually attached to the houses of the nobles. This painting shows the master of the house and his consort listening to the performance of two female singer accompanied by two harps and one flute, while a little girl is beating time with the well-known Egyptian clappers.

Chanting is a medium which existed both in religious ceremonials and secular life. The singers represented in Egyptian pictures "bring their left hand to their left ears in a gesture familiar to many oriental singers of ancient and modern times; the wrinkles, particularly between the eyebrows indicate nasal singing from a compressed throat and probably at a high pitch .... with the right arms the singers communicate with the accompanists by stretching out the right forearms and performing a few stereotyped gestures, they turn the palm upward or the thumb upward, bend the thumb against the forefinger, or turn the palm downward". (Sachs 1944 P.78). The left hand is even used by the modern singer whose aim is to increase the vibration of his voice by placing the thumb behind the ear and moving it quickly; this helps the production of the voice vibration. This practice is common among the sheikhs who recite the Koran.

The Character of Egyptian Music

There are no actual examples of ancient Egyptian music since the chant was transmitted orally and no music was written down, thus predictions can only be made from the paintings. With religious music, "it must have been solemn and majestic. This would correspond with all the philosophical notions entertained by the Egyptians concerning the universe - reflections everywhere directed towards the great contradications of human existence". (Neumann, P.35).

The character of folk music should have been simple and rhythmic as is still the characters of any oriental folk music. In the paintings, the songs were usually "accompanied with dancing with the accompaniment of clapping hands, drums, cymbals and flutes". (Strickland, 1924 P.102). Concerning the character of the martial music, the use of trumpets and drums shows that it did not differ from that of other nations, whether in old or modern times.

What kind of music did the Ancient Egyptian Practice?

Concerning the musical system of Ancient Egypt, the representations on the walls do not give any explanation of the actual musical theory. But some positive information is obtainable by reviewing the instruments used, the way they were performed, the numbers of strings on the instruments, and the spaces between the finger holes in the wind instruments. Our knowledge of Egyptian instruments is rather complete because of the exactness with which they were depicted in sculptures and paintings, and also because examples of such instruments have been found in the tombs. All sorts of instruments, i.e. string, wind, and percussion were illustrated in the paintings and some of them were even found in good condition; their names need not to be listed here. What concerns us are those instruments which may shed some light on the nature of the scale or the tuning of the strings which accordingly will help to inform us about the type of music practiced.

The attempts which were made to discover the intervals used in constructing the old ancient Egyptian scale, were not entirely successful. Some of these were based on measuring the distance between the holes on the pipe instruments, or on the playing of instruments by professional players. The latter is misleading since the player will always try to produce sounds he is accustomed to hear, by adjusting the size of holes, the breath and fingering.

Sachs (1944) discussed the measurements of two Egyptian flutes from a tomb of the middle Kingdom. "One ..... is 95 cm long has fingerholes at ten, eleven, and thirteen fifteenth of its entire length; and the other, only 90 cm. long at eight, nine and ten twelfths. The scale of the first flute was theoretically 15:13, 13:11, 11:10, or 248 - 289 - 165 cents; of the second flute, 12:10, 10:9, 9:8, or 316- 182 - 204 cents. Each has a range of a fifth (702 cents) and the smaller one was correctly subdivided to form a pentachord". (P.73).

Reese (1941) argues from his study of wind instruments that "the old Egyptian native music was probably divided by semitones, while at least some of that imported from Asia made use of small intervals including quarter tones". He comments on multiplicity of scales made possible by the introduction of small intervals. The existence of quarter-tones may also have been due to the Greeks, who split the semi-tone into two micro-tones.

Information about the Egyptian scale was also obtained by examining some of the popular instruments used.

The chief instruments were harps. The number of the strings of this instrument, its shape and size according to which the position of the player differed, shows that this instrument was one of the favoured ones which had been developed through the various dynasties. Since there are no frets in this instrument, each string would have been tuned to a certain pitch. Sachs (1940) argues that "We would not know how they (the harps) were tuned but for a single word hidden in an unexpected source; the Jewish Antiquities of Flavius Josephus, the Jewish historian and General, written in the first century A.D., defines the Egyptian harp as an Organon Trigonon Enarmónion used by temple harpists (hieropsaltia). The Egyptian harp was enharmonic. There cannot be any mistake about this evidence. The enharmonic tetrachord as the Greeks understood it, was composed of a major third and a semitone; the term also applied to a heptad of two such tetrachords conjunct, or to an octave of two such tetrachords disjunct ..... The scale consequently, was approximately A F E C B, with as much repetition through higher or lower octaves as the number of strings presented."

Instruments, with which the number of notes are increased by using frets seemed to follow the same principle. Such instruments came to Egypt from Asia about the 15th dynasty B.C. These fretted instruments all belong to the lute family and the oldest painting of such an instrument was found in the Nakht's tomb at Thebes. The painting shows a lutanist who plays a "West Asiatic lute with nine frets on its long neck. The distinctively drawn frets were tempting enough to stimulate imagination; so Dr.M Von Hornbostel endeavoured to measure the distances between the ligature and translate them into musical cents.

..... The string is divided into two halves; the upper half is again divided into thirds and quarters; the first quarter is split in two and a fifth quarter is fretted beyond the middle of the string. Thus the frets follow two superimposed arithmetic progressions, one in sixths and the other in eighths of the whole, providing a scale in which at least the lowest tetrachord is chromatic .... The principle used here is that the scale is decided not by the ear but equipartition of the strings". (Ibid P.74).

Charles Burney (1935) refers to a musical instrument with two strings and a neck to it. He argued that "This instrument seems to merit a particular description here not only from its great antiquity but from its form; for by having been furnished with a neck, though it had but two strings, it was capable of producing a great number of notes, for instance, if these two things were tuned in fourths they would furnish that series of sounds which the ancients called a heptachord, consisting of two conjunct tetrachords, and if the strings of this instrument .... were tuned a fifth apart they would produce an octave or two disjunct tetrachords .... so this instrument, therefore, is not only a proof that music was cultivated by the Egyptians in the most remote antiquity but that they had discovered the means of extending their scales, and multiplying the sounds of a few strings, by the most simple and commodious expediants".

Tuning the instruments with more than one string in fourths seems a likely solution, since even now players without any musical training who play a rebec try to tune it in fourths. This instrument is very much similar in its description to that mentioned by Burney with its two strings, usually tuned to "g" and "D". Another prediction could be made from the fact that the Egyptians regarded the number "four" as sacred which leads to the conclusion that they may have taken it as the basis of their tonal system. Furthermore, over many centuries, the tetrachord was the base of the actual music practiced in Egypt, and the perfect fourth is a generally accepted interval to the oriental ear. Commonly if one asks a person who plays the piano by ear, he will tend to put the octave interval where a strong accent is required in the rhythmic pattern and a perfect fourth in the weak beat, that is the note in the melody will be accompanied by another note a fourth below. To illustrate this, a folk tune is given below with a typical rhythmic accompaniment used in Egyptian folk songs.

Ex.:

Yet what sort of a tetrachord did exist; was it melodic or harmonic in structure? If melodic, the notes would have been played in succession, and if harmonic, the notes would have been sounded simultaneously in chords. There are different opinions concerning this matter. "Kiesewetter supposes the latter" ..... on the other hand, Dio Cassius entirely rejects this and admits only the Greek system which has the interval of a fourth as a foundation. Neumann also regards "the melodic tetrachord as the oldest and the only authentic one". Curt Sachs arrived at the same conclusion as that of Neumann by examining the examples of melody which still exist in the Middle East to this day. This of course, concerns only the music which is practiced in the monodic structure and not the music practiced by those contemporary musicians who are trying to develop oriental music on the basis of European style.

This does not mean that the harmony was completely absent in ancient Egyptian music, since some of the instruments found indicate otherwise. "Among the wind instruments are double-pipes, and one of a pair apparently sustained a drone while the other sounded a melody. The resulting harmonic intervals would seem not to have been unique". (Reese 1941 P.78). Also there are reliefs in which individual players are shown striking two strings of a harp at once "or in which several players are shown simultaneously striking different strings of similarly constructed harps, these make a good case for the occasional use of fifths, fourths, octaves and unisons". (Ibid). The practice of harmony was also suggested in its simplest form by the use of different instruments with different sizes and nature. If these were sounded together when they differed in structure and tone, e.g. when many stringed harps of large size were used along with smaller ones with a restricted number of strings, or with wind instruments also different in size and percussion instruments, it suggests that although these instruments may have been played in unison, a harmonic accompaniment would have occured.

Rhythm is one of the important components of music. But its practice and nature is different from one culture to another. In

Ancient Egypt, the practice of rhythm is presented in different ways, in paintings in the Egyptian tombs. The movements of the arms and feet, the clapping of hands to mark the rhythmic measure in the absence of percussion instruments provide us with the starting point for understanding what the rhythm was like. This rhythm should have been very strong and marked as with all oriental rhythm. "Indeed so vigorous was the marking of this rhythm that the whole body of the musician swayed to and fro". (Neumann, P.45)

To sum up, the general character of the Ancient Egyptian music is believed to be melodic, with a strong insistence upon rhythm, and with occasional usage of harmony.

The history of Egypt shows that she influenced and was influenced by other cultures. The influence was due either to cosmopolitian reciprocity or to being invaded and colonized. The Eastern Mediterranean, Arabia, Mesopotemia and Iran formed a musical province about 3,000 or more years ago. This is proved by the existence of similar instruments and the usage of the scales throughout.

One of the early invasions was by the Hyksos, who reigned in Egypt over 150 years. They introduced new music, new instruments including drums and castanets. Some of these instruments were included in the temple services such as drums and the long flutes. This invasion was about the 14th dynasty.

A marked fresh impulse came to Egypt's music in the 18th dynasty. Syrian influence appeared in Egyptian culture due to the expansion of Egyptian rule over Syria. Syrian Amirs (Princes and Princesses) came to Egypt, intermarriages took place and an intermingling of the two civilizations occurred. New technical terms came into use. The character of music changed since more strings were added to harps and more percussion and trumpets were used in martial music. Another important feature of this period was "the singing and dancing girls who were sent to Egypt from Syria and other semitic lands, and these girls, becoming part of the harems for a time created an entirely new fashion for oriental music of a secular cast ..... later, the temples adopted female musicians and these began to figure in the religious ceremonial of the New Kingdom .... The oriental influence is however most clearly apparent in numerous Asiatic instruments which flowed into Egypt over many centuries". (Robertson and Stevens, 1960 P.20).

About 323-30 B.C. Egypt became a Greek Colony. Plato who visited Egypt at that time informs us that "only the highest art and the best music is obtained in that country". (Farmer 1954-(A)P822). This raises the question as to who benefited most, the Greeks or the Egyptians? "Indeed the Greeks ..... confess that most of their ancient instruments were of Egyptian invention; as the triangular lyre ...... the single flute, cymbal, kettle drum, and the systrum ...." (BurneyP.169). However, according to Grove's Dictionary "Menecles (3rd Century B.C.) avers that the Alexandrians were the teachers of the Greeks in music, while Diodurus Secilus insists that the Greeks actually appropriated the Egyptian cults ... Yet whatever cultural benefits came with the Greek and Roman Civilization, Egypt well repaid the loan". (Farmer 1954A).

Throughout the different invasions, the Copts, Native Christians of Egypt, have preserved the original features of Ancient pre-Islamic Egyptian music in their church services. All those who conquered Egypt, Greeks, Romans, Arabs and Turks have left them untouched. The melodies of the Coptic Church can be divided into:-

1. Liturgical Melodies hymns, and
2. Religious folk songs.

Most of the hymns are preceded by a few words which indicate the rhythm and the mode to be used. "The melodies are definitely heptatonic, syllabic, with comparatively rare ligatures and graces. The listener is often under the impression of tetrachordal modes". (Sachs 1944 P.97).

The following example was given by Sachs after Newlandsmith:-

The Coptic melodies are still not in notation and are handed down orally from one generation to the next.

In their services, chanting of the hymns is usually done by blind singers. They often use small cymbals and rattles. This habit goes back to the ancients who used the "Systrum" instead. The writer herself has seen one blind man who used to come every Sunday to a coptic neighbourhood and perform some of the hymns with a rhythmic accompaniment performed on a small coffee cup and its saucer. The way he performed this shows a very high rhythmic talent. If one asks many copts why almost all those who sing in Church are blind, the reply is that "only blind people can possess a memory and inner understanding to learn and retain the hundreds of melodies and perform them rightly".

Sachs, who attended some of the services in the Coptic Churches in Cairo and Upper-Egypt, argues that "Who attends coptic services must be struck by the discouraging vagueness of all notes inside a fourth or a fifth, as a consequence, will prefer to refrain from modal analysis. The question how to interpret this vagueness is difficult; is it an inherent quality of the Coptic- and hence Egyptian-style or is it a consequence of degeneration? In face of the nature of singing in general and of oriental singing particularly, inheritance is likelier than decadence". (Ibid p.97).

At the present time, there is a tendency to record and write these melodies, as the few old singers who are still living are diminishing and with their death some of the old true melodies will vanish.

When Egypt became Arabianized (7th century A.D.), she received all the achievements of Arab and Moslem thinkers and philosophers. On the other hand, Egypt made her own contribution to Arab Civilization. As mentioned above, the old Egyptian Music was preserved by the coptic priests and Arabian music replaced it in general practice. A brief review is given below of the development of Islamic music.

Islam and Music

As far as music is concerned, EL-Kholy (1953) pointed out that the Koran "does not reveal any positive attitude towards music, neither of approval nor of censure. According to the Koran alone, where no actual prohibition is specified, a kind of tacit approval should be assumed". (P,5) However, the problem raised great controversy among Moslem thinkers and theologians.

The Prophet's attitude toward music was rather conservative. Although he allowed music on joyous occasions - such as marriages and circumcisions and recognized the appeal of a beautiful voice, he, on the other hand, avoided music which accompanied poetry and stated that "the chanting of the Koran should be different from the singing of poetry". The chanting of the Koran depends on the mere modulation of the voice which could be grasped by either the learned and unlearned in music alike. This indicates something different from "ghina" (singing proper) which is practiced by a trained musician.

The earliest (Fuqaha) interpreted the Prophet's attitude as unfavourable, and condemned the listening to music.

The four great legal schools of Islam were the Hanafi, the Malki, the Shafi'i, and the Hanbali; their views of Islamic law were:- (1)

1. Abou-Hanifa pronounced his decided dislike for singing, listing it under the same category as anyone who plays the pandore (tanbur). Both acts were considered major sins.
2. Malik Ibn-Anas proscribed singing and commanded Moslems to return a girl if it is discovered that she is a singer. Ibn Taymiya tells that Malik on being asked what form of singing was permissible according to the people of Medina, replied "among us, it is only the dissipated who sing".
3. AL-Shafi'i proved a little more liberal-minded on this question, if only in placing some reservations on the legal dislike of music, and attaching to it certain conditions. He states cautiously that although music is not categorically prohibited, yet it is unworthy of a good Moslem to indulge in it.
4. Ibn-Hanbal who was head of the strictest and most rigid of all schools naturally disliked music.

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(1) Summerized From EL-Kholy, 1953.

EL-Kholy's remarks on those arguments "Perhaps the most concise and straight-forward comment on this controversy among the authorities themselves and between the theory and reality as well, is that which states that anyone who commits something on which there is disagreement between the jurists, will not be punished for it". (EL-Kholy 1953 P.22).

Nonetheless, music received great attention from two major brands of thought in Islam, namely: mysticism, (Sufism) and philosophy.

<u>In Mysticism</u>, music became a means of "revelation" attained through ecstacy. Its aesthetic value was of minor importance. AL-Hagwari and AL-Gazali divided those who are influenced by music into two groups: the first are interested in the material sound, and the others are attracted by the spiritual meaning. The latter "do not hear mere notes, rhythms or modes but music per se" (Farmer 1926 P.91) Dhī L-Nun, the Egyptian Sufi said:-

"Listening to music (al-Samaᶜ) is a divine influence which stirs the heart to seek ALLah, and those who listen to it spiritually attain to ALLah, and those who listen to it sensually fall into heresy".

The word music (aL sama$^{\varepsilon}$) in the mystic tradition covers, as EL-Kholy (1953) stated, three types of exercise which make the Sufi liturgy both rhythmical and melodic. These types are as follows:-

1. The reciting of God's name, in a form of litany (d̈hikr);
2. The chanting of religious poems; and
3. The ecstatic dance (Raqs).

However, the major contribution to Islamic music was made not by mysticists but by musicians who practiced the art after the interaction between the Arab-world and both Persian and Greek cultures.

Farmer (1939) points out that the history of Arabian music may be divided into four distinct systems:-

1. The Old Arabian School;
2. The Greek Scholiasts;
3. The Systematic School; and
4. The Modern School.

Each of these schools practiced, and was characterized by certain features. The old classical school was established at the courts of the Umayyad Caliphate. EL-Kholy (1953) summerized the main features of Islamic music at that time as follows:-

"..... The major points of special significance to the nature of Islamic music are: the existence of three types of instruments i.e. percussion, wind and strings, the somewhat advanced technique required in tuning and playing the lute, and the scale in common use, as applied to that instrument, a developed sense of tune and rhythm, the introduction of intricate rhythmic modes, independent from the metre of the poetry, an elaborate technique in the vocal art, not devoid of feeling, expression and gradation of tone". (PP.124-125).

Information about the state of music during the 9th century A.D. shows that some Persian influence appeared in the actual practice such as the tuning of the lute, which was the main instrument used, and which acted as the main basis of Arabian music theory. The strings became A-D-G-C, instead of C-D-G-A. The Persian minor third (303 cents) was also used. This minor third is quite close to the Pythagorian minor third (294 cents). The practice became more complicated when the pre-Islamic interval of three-quarter tone (151 cents) was introduced by Zalzal the Persian lutenist causing a neutral third of 355 cents. The influence also affected the rhythmic modes used.

However, AL Mawsili (d.236 A.H.[1]=850 A.D.) the famous musician and theoretician of this period opposed all these "alien contrarities" and fixed the theory of the classical school on the basis of his four stringed lute. The fretting is based on using whole tones (204 cents) and Limmas (90 cents).

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(1) A.H.(ANNO HIJRAE)

The resulting scale was very similar to the Pythagorian which is more suitable for homophonic music. The third is a useful melodic interval. For more details about the fretting established by Al-Mawsili see Appendix I.

The theory of music was also established by Moslem philosophers who were influenced by the translated writings of the Ancient Greeks on Music. Al-Kindi (d. 874 A.D.) followed Euclid in his treatment of sounds, intervals, species, systems, modes, mutations and composition. He used a one octave alphabetic notation. Al-Kindi, also, gave a detailed account of the rhythmic modes used. These are included in Appendix I. The addition of a fifth string to the lute was suggested by him in order to arrive at the double octave without shift.

By the time of Al-Farabi (d.339 A.H. 950 A.D.) further additions had been made to the scale. The old Zalzalian Wusta frets had been introduced. Farmer (1921) describes this innovation as follows:-

To accomplish this "a fret called the 'Mudjunnab' had to be introduced at 114 cents between the 'Mutlak' and the 'Sabbaba fret' at 145 and 168 cents, with the result that there were now three 'Mudjannab' frets known respectively as the Ancient, Persian and Zalzalian, whilst the one of 114 cents had disappeared. See Appendix I, table I for the detailed fretting.

Al-Farabi was, perhaps, the greatest of all Moslem philosophers. His book, "Kitab Al-Musika al-Kabir", The Grand Book of Music" probably deserved to rank as one of the greatest works that had been written on music. (Farmer 1921, p. 5). In this work, he classified the types of music into three: the pleasant, the passionate and the imaginative. El-Kholy (1953) makes the following comparisons of Al-Farabi's views on the origin of music with some modern views.

"Karl Bucher in his book (Work and Rhythm) suggests that the origin of music is a natural tendency to express bodily labour rhythmically as rhythm simplifies work. Al-Farabi mentions the effect of music in the case of bodily labour, and explains how men seek to overcome exertion and fatigue by means of song and gives this as one of the innate tendencies in man, which drives him to express himself in music." (p. 145). Al-Farabi also, discussed the creation of instruments. He stated that they were created to support and elaborate the human voice as their quality of tone is supposed to be inferior to that of the human voice.(1)

Al-Farabi also tackled some of the principles of harmony which is known as "tarkibat" (the simultaneous striking of sounds). He said that "if we contemplate the melodies attentively, we will find Iktranat and Tartibat(2). By Iktranat he means the simultaneous combination of two notes or more when sounded together, while Tartibat means the successive combination of notes. "In both of these there are those which are "natural" and "complete" (he means consonant) when heard and those which are otherwise (dissonant). He adds the ___________

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(1) In a recent article on Al-Farabi's Grand Book of Music, El-Hefni (1968) writes "when Al-Farabi spoke about the creation of instruments he stated that "man created them to make melodies with meaningful vocal phrases more pleasant". El-Hefni commented on this theory as being very similar to the theory of Montiverdi, Catchini, and Giovani Pattesta who recognised the importance of the word in both musical meaning and musical performance.

(2) The Arabic text is obtained from El-Hefni (1968) and the translation is made by the writer.

following metaphor. "The Completeness of the Iktranat and the Tartibat are conceived through fittingness. The completeness of the Iktranat is like the colour of wine and glass when combined, the colour of ruby and gold if combined, and the cerulean sky with the colourless pearl. Thus we can call the completeness of the Iktranat as concordance of tones and its uncompleteness as "tnafor" and "tbayon" or discordance; the completeness of the tartibat is conceived through the arrangement of the intervals one after the other and the beautiful ornaments".

Another Islamic philosopher who wrote on music is Avicenna (11th Cent). His major contribution is the idea of (Tarkibat) which he described as "produced by means of one beat which continues upon two strings, (i.e. of the lute), the note sought and that which is along with it upon the fourth, or fifth and other than these, as if these two were falling in the one time - (the tadif) - doubling of notes - is like tarkibat except that they are in the octave". (EL-Kholy 1953 P.156). The concepts of tarkib and tadif may be the forerunner of the organum, an initial style of harmony, and the only polyphonic form of it known to mediavel Europe. Avicenna's concept of "tarkib" may be an elaboration of AL-Farabi's concepts of concordance and discordance. The only difference was that AL-Farabi's concepts were perceived horizontally and in succession (that is two notes were consonant if agreeable when sounded one after another) whereas Avicenna's, "tarkib", concept was considered vertically, the two notes being sounded simultaneously. Yet "tarkib" and tadif must have been conceived melodically rather than harmonically. In this regard, EL-Kholy (1953) commented:-

"The tadif and tarkib were discussed among other ornaments of melody .... as devices used in adorning and elaborating the original melodic line. An essential part of Oriental and Islamic music traditions, characteristics of it, in the past and the present, is the comparative freedom of the performers to elaborate each in his or her individual style, on a given melody that is being performed. The devices used for that purpose at the time of Ibn Sina as detailed by him are "tarid", which closely corresponds to the modern "tremolo" and the "tamzig" which apparently is a form of "trill" and "tawsil" which is known as in modern times as "glissando" and the tarkib mentioned before". (P.160).

Farmer's (1925-1960) writings confirm the ideas of EL-Kholy. He states that organizing (tarkib) is alien to pure Arabian music, and it was only adopted by the Arabs after contact with the Greek theorists, when they would appear to have extended Aristotle's principle of magddizing into organizing" (P.65 1925). He continues, "In view of their practice of the tarkibat, it may be asked 'how was it that the Moslems did not develop harmony?'. The answer is that in our middle ages, the Moslems knew the principles of harmony, in the Greek sense of harmonia, better than Europe did, but they viewed the laws of "harmonia" horizontally, and continued to do so, whereas Europe, since the 10th century, has apprehended a vertical harmony. The Moslems have advanced in their horizontal harmonia as much as the European had developed in its vertical harmony". (P.471,1960).

It is worth mentioning here that by that time, AL-Farabi and Ibn-Sina had also recognized both the major and the minor thirds as consonances. "The Arabian pandore (Tanbur) which became very popular in Europe gave a close approximation of 6561:8193 to the major third 4:5 and one may conclude that it was by these means that Europe first became dissatisfied with the Pythagorian thirds, (64:81 and 27:32), and adopted the new ones" .....
(Farmer 1925 P.66).

Since the 9th century, the Greek influence was felt in the writing of Arab music theorists among whom are AL-Kindi, AL-Farabi, Ibn Sina, and also Ibn-AL-Hatim (d.430-1039) and Abu'L-Salt Umaiya (d.528 A.H.=1134 A.D.) from Egypt. The latter writer's contribution was The Risala fi'L Musiqi (A Treatise on Music). One of the 12th century Arab theorists who were known to Western Europe was Ibn-Rushed or Averoes.

It was Ibn-Rushed's commentary on the physical basis of sounds as contained in Aristotle's De Anima, which became well known in

Europe in the Latin translations of Michael Scote.

By the close of the 13th century, the influence of the Greek Scholiasts was diminishing, and the systematist school became dominant. The founder of this school was Safi al-Din. (d.692 A.H. 1294 A.D.). He is considered the most notable theorist after those of the 10th and 11th centuries. He opposed both AL-Farabi and Ibn-Sina and followed the principle of dividing the scale into limma, limma, comma, thus yielding an octave of seventeen intervals. In this way he was able to make use of the Zalzalian notes of 355 and 853 cents which approximate closely to 384 and 882. Parry (1869) considered this scale as "the most perfect ever devised" (P.29) and Helmholtz (1895) also considered the theory of the Systematist school as "note-worthy in the history of the development of music". (P.283) The division of Safi al-Din are shown in Appendix I, table 2.

After the 13th century, there was a notable cultural decline due to the fall of Baghdad (1258). This was increased by the expulsion of the Moslems from Spain who were mainly opposed to listening to music, and one can notice the increasing number of treatises by legalists on the question whether listening to music is lawful or not. However some of these treatises defended the art, and used music as an aid to religion. In the 14th and 15th centuries, there was a decline in the Arabic culture in favour of the Persian.

At the same time the influence of the Turks was noticed especially in the Near East. Turkish treatises began to appear, while Arabic ones were also studied in Turkish treatises. Generally, through the 17th and 18th centuries, the art of music did not achieve any development which interests us here. By the 19th century, mainly at its close, new treatises on music were written, and fresh impulse came from Egyptian writers on music such as Shihab al-Din (1892), AL-Khulaᶜii, Darwish Muhammad, and EL-Hefni in the present century. By 1900 the modern school was established with its system based on quarter tone music. The notable theorist in this school is Mikhail Mushaka (d.1888), though he points out that he did not himself invent the theory. The origins of quarter-tone have been discussed by many writers. "Lachmann holds that it was due to the needs of transposition". (Farmer 1954 C). On the other hand, Collangetts avers that in actual practice it is simply the Systematist scale" (in Farmer 1929 P.754). A Turkish writer (Mahmud Raghib) argues that quarter tones originated with the Greeks who divided the octave into 24 equal parts of 50 cents. In Egypt the system formulated by Shihab al-Din divided both major and minor tones into four parts thus giving 28 intervals to the octave. However Mushaka's principle of quarter-tones represents equal temperament with a quarter-tone scale, as with the Greeks (1)

"This system is generally accepted to-day throughout the Islamic near east and even the middle east". (Farmer 1921 P.754). The division into equal quarter-tones led to a more mathematically accurate scale and also helped to preserve the colourful quality of oriental music by preserving the three types of tones i.e. tone, semitone and three-quarter tone.

All through these centuries, the different stages of the oriental musical systems influenced the music practiced in Egypt. However, the different systems also led to confusion which complicated the general understanding of the music practiced throughout the Arab-World. In the present century, more interest is being taken in music, after its decline throughout the 17th and 18th centuries. One overall theoretical system was needed and the result was that five conferences were held in Cairo, Lebanon and Baghdad to discuss and to seek the best system which might help in developing oriental music. Three of these conferences were held in Cairo in 1932, 1959, and 1964, the fourth conference was held in Lebanon in 1956 and the last was held in Iraq in 1964.

The most important one was that of 1932.

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(1) The same principle was laid down by Kamil EL-Kholaii towards the end of the 19th century, who made it the basis of all modes.

The first Cairo conference divided into seven commissions each dealing with a separate topic as follows:-[1]

1. Mode Commission:- its work was to analyse and classify modes, rhythms and compositions used in Egypt and other Islamic lands.

2. The Commission of the musical scale:- its duty was to inquire into the basis of the quarter-tone scales used in Egypt and the Islamic East in general with a view to adopting an equal tempered scale.

3. The Commission of musical instruments:- its programme included the listing of instruments used to-day in Egypt, with recommendations as to improved construction and to consider which instruments of Europe could be introduced into Arabian music.

4. The Commission of Registration:- The finest bands from nearly all the Arab countries played and their best performances were selected and recorded by H.M.V.

5. The Commission of Education:- Its business was to discuss methods of education in music and to choose those which seemed to be suitable for adoption in the schools.

6. The Commission of History and Manuscripts: and

7. The Commission of general Questions:- it dealt only with questions that did not come within the scope of other commissions.

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(1) The 1932 Cairo Conference (Arabic Text) and Translation after Farmer (1933).

The 1959 and the 1964 conferences were conducted on more or less the same lines as the 1932 conference. The members came only from Arab countries, mostly from Egypt.

The following discussion takes up the modes used in Egypt, patterns of rhythm and the tempered scale. A discussion about music education in Egypt will be included later.

Discussion of the modes or maqams will need to be extensive, since there are many different opinions concerning the development of these maqams. As there are about 96 different maqams in use in the different Arab countries, it was suggested that this number should be lessened "by including those which are considered to be basic and excluding those which are similar to others but only different in their tonic notes (transposed maqams). A maqam should be considered according to its first tetrachord and not by its second". (Salah El-Din 1959 P.50).

<u>What is a maqam or mode?</u> A maqam is a graduated series of pitches which are arranged in a certain scheme of intervals. Each maqam is characterized by its tonic, first tetrachord and its compass. Generally each maqam consists of two tetrachords either conjunct or disjunct. The tetrachord is formed by a succession of four notes different in pitch, which will form either a perfect, or diminished, or augmented fourth.

The Commission of modes in the 1964 Conference summerized the types of tetrachords used to form the modes mostly used in Egypt as follows;-- (Arabic Music Conference 1964 P.13).

1. Rast: (Perfect Fourth)

	Tone		$\frac{3}{4}$Tone		$\frac{3}{4}$Tone	
C		D		Ed[1]		F

2. The Baiati: (Perfect Fourth)

	$\frac{3}{4}$Tone		$\frac{3}{4}$Tone		Tone	
D		Ed		F		G

3. The Kord: (Perfect Fourth)

	$\frac{1}{2}$Tone		Tone		Tone	
D		Eb		F		G

4. The Nahawand (Perfect Fourth)

	Tone		$\frac{1}{2}$Tone		Tone	
C		D		Eb		F

---

(1) The sign d is used to flatten the note $\frac{1}{2}$ tone.

5. The Hejaz: (Perfect Fourth)

½Tone — 1½Tone — ½Tone

D Eb F# G

6. The Agam: (Perfect Fourth)

Tone — Tone — ½Tone

Eb C D Eb

7. The Irak: (Perfect Fourth)

¾Tone — Tone — ¾Tone

Bd C D Ed

8. The Saba: (Diminished Fourth)

¾Tone — ¾Tone — ½Tone

D Ed F Gb

9. The Hozam (Diminished Fourth)

¾Tone — Tone — ½Tone

Ed F G Ab

10. The Nawa-Ather (Augmented Fourth)

Tone — ½Tone — 1½Tone

C D Eb F#

11. The Sikah(Augmented Fourth)

$\frac{3}{4}$ Tone	Tone	Tone	
Ed	F	G	A

Each of the above mentioned tetrachords is the first tetrachord of the principle maqams used in Egypt. The second tetrachord of these maqams may be any of these tetrachords transposed i.e. A Rast tetrachord starting from G will be as follows:-

Tone	$\frac{3}{4}$ Tone	$\frac{3}{4}$ Tone	
G	A	Bd	C

This tetrachord, like any of the others, could be used as a conjunct or a disjunct tetrachord to any one of the 11 principal tetrachords to form a maqam.(1)

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(1) In devising ~~the melody~~ the Melody Identification test for the adult groups in this investigation, some of these tetrachords were used as the base of the melody. (See page 330 below)

The Tempered Scale:-

What is meant by the oriental tempered scale?

Although quarter tone music is found in all the Arab countries, and although the same maqams exist, there are differences in the actual practice. Thus if a lute player is asked to play the Rast maqam, he may produce it differently from a player from another country, because these maqams were mainly learned by ear. The older teachers considered the Ed in the Rast maqam to be higher in frequency than the Ed which exists in the Baiati maqam, simply because the first is usually used in songs with a strong effect, while the latter seems to be more tender in character. Even in one maqam, players from the same country differed. It was mentioned by Raouf Yekta Bey, (In Sachs 1944), that when two notable musicians were tested with the first pentachord of a melody in the maqam Nahawand, the following frequencies (A) and (B) were produced by the two musicians. The normal distances are indicated by (N)

A	179	-108 -	193 -	222	cents
B	180 -	144 -	209 -	169	cents
N	204 -	90 -	204 -	204	cents

With such varying practices it did not seem possible to develop sound teaching of oriental music. Two contrasting opinions were expressed on the best policy.

1. <u>The educator's opinion</u>: which tended to simplyfy practice by adopting the systematic principle of dividing the octave into 24 equal quarter tones, each quarter equal to 150 cents.

2. <u>The musician's opinion</u>: musicians said that doing this will affect the character of each maqam although the discrepancy might be only one or two cents in some cases.

Although some Egyptian musicians were not in favour of the tempered scale, it was decided that "in Egypt the maqams should be practiced according to the tempered quarter-tone scale". (1932 Conference)

The following table * (3) shows the number of cents in each quarter tone in the old Arabic and the tempered scales. The numbers 1-24 indicate the position of the quarter-tones in the scale with the corresponding Arabic names.

---

* From AlIAWardi (1948 P.153)

Table (3)

Quarters	Arabic Names	French Names	Arabic Scale	Tempered Scale
0	Mutlaq Rast	Doh	00	00
1	Nim Zirkolah	‡	90 cents	50 Cents
2	Zirkolah	#	114 "	100 "
3	Tak Kirkolah	#‡	180 "	150 "
4	DoKah	Re	204 "	200 "
5	Nim Kordy	‡	294 "	250 "
6	Kordy	#	318 "	300 "
7	Sikah	#‡	382 "	350 "
8	Nim Bosalik	Mi	408 "	400 "
9	Bosalik	‡	474 "	450 "
10	Giharkah	Fa	498 "	500 "
11	Nim Hijaz	‡	588 "	550 "
12	Hijaz	#	612 "	600 "
13	Tek Hijaz	#‡	678 "	650 "
14	Nawa	Soh	702 "	700 "
15	Nim Hisar	‡	792 "	750 "
16	Hisar	#	816 "	800 "
17	Tek Hisar	#‡	882 "	850 "
18	Hosen	Lah	906 "	900 "
19	Nim Agam	‡	972 "	950 "
20	Agam	#	996 "	1000 "
21	Awg	#‡	1086 "	1050 "
22	Nim Mahor	Ti	1110 "	1100 "
23	Mahor	‡	1167 "	1150, "
24	Kerdan	Doh'	1200 "	1200 "

It noticed that in quarter-tone music, no intervals are used which are less than a semi-tone; the actual intervals are:-

$\frac{1}{2}$ tone

$\frac{3}{4}$ tone

1 tone

and, $1\frac{1}{2}$ tone.

These are the intervals between two successive tones, but other established intervals i.e. the 3rd, 4th, 5th, 6th, 7th and octave; are used in building up a melody.

One of the chief characteristics of oriental music generally and of Islamic music is Rhythm or "Īqāʿ". It plays a greater part in oriental music than in accidental music. Rhythm in accidental music is organized in relation to bar lines and takes definite regular forms such as duple, triple or quadruple beats. But in oriental music the principles are different. For example an Arabian 9 crotchets movement of rhythm would with accidentals be conceived as . 3 + 3 + 3 crotchets. This rhythm in Egypt may be treated as 3+ 2 + 2 + 2 as in the "AKsak Samaʿi "rhythmic pattern". Oriental rnythmic patters differ from one Arab country to another and differ also according to whether it accompanies vocal or instrumental performance. It was mentioned in the 1932 Conference, that the number of the rhythmic patterns are about 300. In regard to these patterns practiced in Egypt, the rhythmic committee decided, as follows:-

1. The rhythmic patterns should follow these time signatures.

$\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{6}{4}$ $\frac{7}{4}$ $\frac{8}{4}$ $\frac{12}{4}$ and $\frac{13}{4}$ if the crotchet is the beat, and $\frac{2}{8}$ $\frac{3}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ $\frac{8}{8}$ $\frac{12}{8}$ $\frac{13}{8}$ $\frac{14}{8}$ if the quaver is the beat.

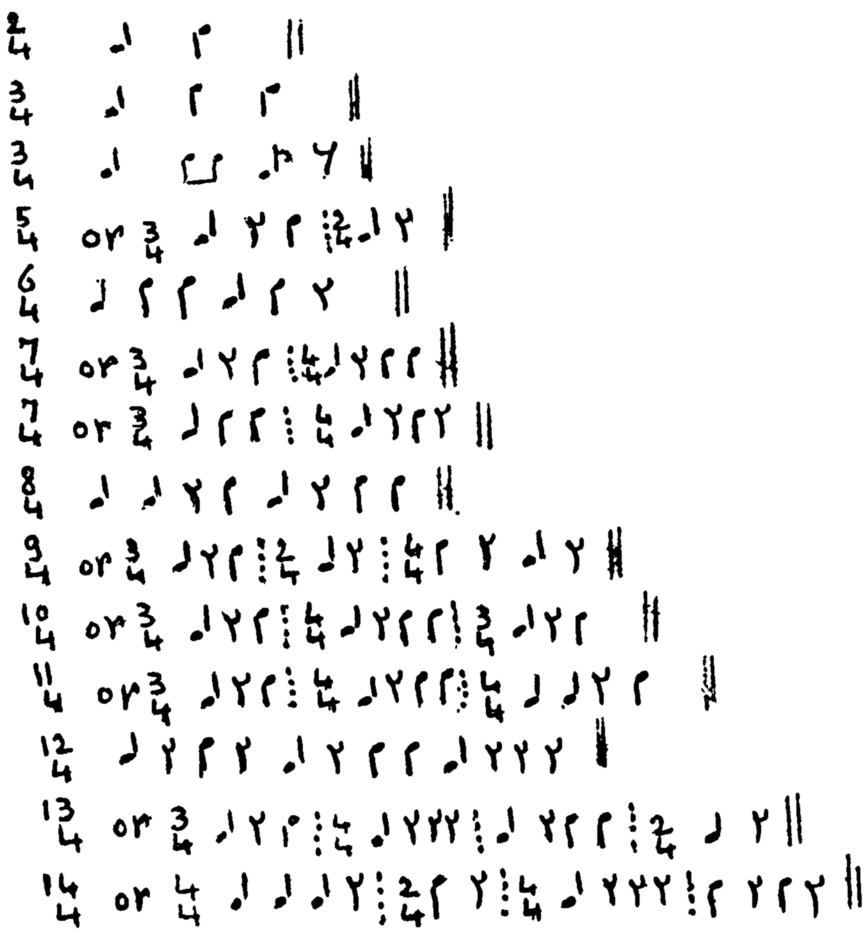
2. Each pattern follows a certain order of strong and weak beats. The strong one is known as the Tum and is signified by writing

the head of the note down ( ), and the weak beat is known as a Tak and is signified by writing the head of the note ( ) up.

3. The silences in each pattern can be filled with ornaments, and this is left to the composer or performer to decide.

4. Patterns which do not fit into one of the mentioned above time signature can be written by dividing into two or more time signatures. An example of such patterns is $\frac{9}{4}$ as mentioned above.

5. The Committee decided that the following patterns are those which are mostly used by Egyptian composers:-



Each of these rhythmic patterns has a certain Arabic name which need be stated only at the beginning of the composition and when changed, the new name should be mentioned.

Harmony, as understood by Europeans, does not exist in Egyptian music. Some recent attempts have been made by contemporary composers to harmonize oriental melodies. Their attempts depend on the idea that those modes which are based on tones and half-tones can be harmonized. Also those which have a $\frac{3}{4}$ tone system can be harmonized using the quarter-tones as passing notes, ornaments in the melody, or preparatory resolutions. However, their attempts do not satisfy those who belong to the old school, for, in their opinion, they will make the oriental system loose its main attributes which are "modal homophony, fioriture and rhythm" (Farmer 1960 P.447).

Although these principles are followed in all kinds of music, oriental music is not easily accepted by occidental listeners. The first impression is always unfavourable. "In fact, to be able to judge oriental music and to appreciate it, it is as necessary to understand it as it is necessary to possess a language in order to be able to appreciate its real beauties". (Danial 1914 P.45). This is very true since oriental music is governed by laws which are alien to western music. Although it includes major and minor scales, oriental music is based on modes which are numerous and which give the melody a chance of developing along diffenent lines. Generally western music is perceived vertically, while oriental is perceived horizontally. Western harmony involves a combination of melodic threads sounded simultaneously, while oriental harmony is an agreeable sequence of sounds sounded successively in certain rhythmic patterns. However, oriental music has often been and still is appreciated by Western people and Edward Lane who wrote about the Manners and Customs of Modern Egyptians (1908) has expressed this. "I must confess that I generally take great delight in the more refined kind of music I occasionally hear in Egypt; and the more I became habituated to the style, the more I am pleased with it".

To sum up, listening to music depends on acquired habits. What we tend to reject to-day, may be accepted later and "the exception of yesterday becomes the rule of today". (Danial (1914 P.51)

CHAPTER II

Theoretical Background

Music has been recognized by many educators as an essential subject and thus included in the curriculum in schools at all levels in most countries. Music became part of the curriculum in Egypt since 1937 and was made a compulsory subject in some of the schools at the preparatory stage for pupils who show that they will profit from special music education. But since the progress of any student who tries to study music will depend on his musical ability, those who concerned with music education naturally wish to know on what basis can such a student be selected. Without knowing what the term "musical ability" means, the basis also will not be unsatisfactory.

In every day life, the concept of ability is generally used to indicate that a certain individual can do or perform an act e.g. to sing, to dance, to read, to write, to type ... etc. Warren (1934) defines ability as the power to perform responsive acts. Drever (1953) and Carr & Kinsbury (1938) suggest similar definitions. The latter argues that this concept has a threefold reference:

(1) "It refers to the observed act from which its existence is inferred and in terms of which it is named.

(2) It is also a predictive concept in that it refers to the possibility of repeating the act on the next day and the day thereafter.

(3) It is also an attributive definition of the reactive nature of the individual in virtue of his possessions of those constitutional conditions upon which the occurrence of the act is contingent and which render possible its future performance"(P.354).

Vernon (1950) defines ability from a factorial-analytic point of view as "Ability implies the existence of a group or category of performances which correlate highly with one another and which are relatively distinct from (i.e. give low correlation with) other performances". (P.4). To Thurstone (1947) the term "ability" is defined as "What an individual can do", which implies that there are as many abilities as there are things that individuals can do. This definition is so wide that there is no difference between the terms "performance" and "ability".

As there are many definitions of the term "ability" so also the term "musical ability" differs in definition. The definitions follow certain theories or ideas which are advocated by certain psychologists, also by those who have done research in this field, who have in mind certain aspects of the nature of musical ability. Other terms such as musicality, musical talent, musical ability and musical capacity are used to distinguish the person who can perform musical acts from the unmusical.

The term musicality was defined by several writers. Billroth (1896) defines it as "the ability to retain and always recognize and reproduce a short, rhythmical, and definitely organized melody". Meyer (1898) considered those who can analyse the constituent tones of a simultaneous clang of short duration as being musical, while Wundt (1910) stressed memory which enables the "musical" person to retain and recognize intervals. Besides memory, Crzellitzer (1910) stressed sight singing and being able to judge intervals "within an error of a semi-tone". Rupp (1919) argued that a musically gifted person should be able to judge intervals, to produce and recognize a melody, to be able to analyze a chord; have a harmonic feeling, sense of time and rhythm and absolute pitch Stumpf (1898) named four criteria which should be present in a person judged as being musical. They are as follows:-

(1) To sing a given tone correctly; (2) to discriminate higher and lower tones; (3) to judge whether one or two tones are present in a clang; and (4) to discriminate between degrees of consonance as to pleasantness. It is noticed that all these early studies stressed what could be called fundamental aspects of the ability to succeed in and benefit from, music education. Other psychologists draw attention to the importance of aesthetic judgment. Revesz (1925) argued that musicality, primarily, denotes the ability to enjoy music aesthetically". To him the musical person should have "a fine developed instinct of the style and the rigid order of a musical sequence of ideas". Other characteristics of the musical person are (1) " his capacity to become absorbed in the emotions expressed

by music" and (2) "his ability to enter into so intimate a relation with it that the whole organization of his soul is affected".(P.22). He argued that, "Not emotion, enthusiasm, love of music, a warm interest in it, but the mental conquest of music as art characterizes the musical person". (1953 P.133). He also considers musicality as a fundamental entity which cannot be evoked by education but only develops through it. Hevner (1937) stated that musicality involves a keen perception of the music qualities of rhythm, harmony and melody, or all these elements combined, without which its beauties may be completely lost. On this philosophy, the Oregan music discriminationtests were devised.

Mursell and Glenn defined musicality as "an almost universal endowment among school children ... The musical child is one who possesses an innate urge toward music. Such a child may or may not possess the talents which will make him a fine executant artist or an effective composer .... Musicality essentially depends upon will. If the will is lacking, musicality itself is lacking". (1938 P.33).

Schoen (1940) distinguished between musicality and musical talent. The latter refers to musical performance or productive skills. The two are complementary, but "musicality" can exist without "talent" and visa versa. Howevever, other psychologists do not separate the two e.g. Seashore includes musicality as part of musical talent. Wing (1936) suggested that musical appreciation (the aesthetic side) and musical ability, (which he defines as "the power to listen to music intelligently", could be combined under the term of musical capacity. Warren (1934) defines "capacity" as "the full potentiality of an individual for any function, as limited by his native constitution and as measured, theoretically, by the extent to which that function would develop under optimal. conditions". For both Seashore and Schoen, capacity refers to inborn traits, while the term ability to Seashore is used "to designate acquired skill in the use of a capacity. Thus each of us has a certain native capacity of memory, but we develop various kinds and degrees of ability in the use of this capacity" (Seashore 1919 P.14-15). To Revesz this "inborn capacity" of a person which enables him to realize and to develop certain general or specific types of behaviour and capacities, is designated as "aptitude". He indicates that while "aptitude indicates fitness for performance, talent indicates capacities for above the average in a special field of human activity". (Revesz 1953 P.142). Revesz distinguished between two kinds of talents in music namely reproductive and interpretative or creative talents. These two types are independant but there are some exceptions, i.e. persons in whom both are combined.

These are some of the definitions used by psychologists who are interested in the field of music. But how far do these definitions specify the nature of the musical person?

In the field of the psychology of music, there are two main theories which are extremely different from one another. Each theory has its supporters who try to prove it by empirical methods. These two theories may be designated as:

1. The Theory of Specific ,

and 2. Omnibus Theories.

C.E.Seashore in his two works on the psychology of music (1919 and 1938) stated that musical talent may be divided into a number of sharply defined abilities. "Musical talent is not a single talent, it is a hierarchy of talents many of which are entirely independent of one another .... The talents naturally group themselves as that we have for example, the tonal group the rhythmic group, the motor group and others ...." (1919 P.6).

To measure these talents, Seashore constructed a battery of tests intended to cover the most important of these musical talents according to his philosophy.

His battery of tests (which will be described below) tends to measure only the sensory capacities which are, of course, very fundamental to the music student who intends to be either a teacher or performer, but omits other aspects of music, such as creative feeling, which, in Seashore's view depend more on acquired experience.

Schoen, in his Psychology of Music (1940) seems to be in agreement. He states: "Talent for music is not a single power or capacity, but consists of several groups of talents, each group performing a specific and definite function in the making of the artist" .... (P.162). On the other hand, he differs from Seashore as to what the different capacities are and which are most important. His analysis of musical talent includes primary and secondary factors. The latter depend on the former and without them cannot exist. Those which come under the primary factors are: (1) Auditory sensitivity: in which the requirements are to be sensitive to fine differences in pitch, intensity, timbre and duration, and without which "the performer may be faulty in such vital artistic effects as good intonation, a singing tone, a tone of varied dynamic contrasts and fine rhythmic balance and symmetry. These four items form the very basis of musical talent" (Ibid P.153). These capacities are similar to those mentioned by Seashore, and are intended to be covered by his tests. (2) Musical feeling and Musical Understanding: these include: absolute pitch, relative pitch, tonal memory, tonal sequence, consonance, tonal and harmonic sequence, and rhythm. "These factors", he states, "constitute the general musicianship of the person". ....and are indicative "of the degree of his aesthetic sensitivity to the material of music, both melodic and harmonic". (3) Musical Virtuosity: which is granted by the possession of motor equipment required in expressing one's self articulately.

The Secondary Factors include "(1) intelligence, (2) musical memory, (3) will power and resolve, (4) self-confidence, and (5) temperament".

The factors mentioned by Schoen can be classified into three groups (1) those which deal with the fundamentals of a musical person, as mentioned in his primary factors (2) intellectual aspects which appear in Nos. (1) and (2) of his secondary factors and (3) motivational characteristics which appear in Nos. 3, 4 and 5 of his secondary factors.

Another follower of this theory of specifics is Drake, who stated (1939) that "there are five or possibly more separate abilities constituting what we call musical talent. All are, however, dependent upon, knit together by, or related to musical memory ..... one or two, or even all, may be present in varying degrees in any particular individual ..... (and when present together) in a maximum degree in one person we have a musical prodigy, or genius". The five factors are:-

(1) Memory: which he considers to be the "basic element".

(2) Pitch discrimination,

(3) Sense of rhythm,

(4) Musical intelligence, musical sensitivity or musical insight - "which may be as important as any of other factors".

(5) A mechanical factor "not strictly a common factor in all musical expression.

It is noticed that this classification is very similar to that of Schoen in including sensory and intellectual factors. The latter are not covered by Seashore's measures but included in his structure of the musical mind under these headings:-

(1) Musical Sensitivity, which deals with the sensory pitch intensity, time and extensity. All these four aspects are considered as "simple forms of impression", while those which deal with "complex forms of appreciation" are (1) sense of rhythm; (2) sense of timbre, (3) sense of consonance and sense of volume.

(2) Musical Action: which deal with the control of (1) pitch, (2) intensity, (3) time, (4) rhythm, (5) timbre and (6) volume.

(3) Musical Memory and Imagination: which deal with auditory and motor imagery, creative imagination, memory span and learning span.

(4) Musical intellect: which includes
(a) musical free association (b) musical power of reflection and (c) general intelligence.

(5) Musical taste: which includes
(a) musical taste, (b) emotional reaction to music and (c) emotional self-expression in music.

Mainwaring (1947) also follows this theory and he states that "musical ability includes at least a number of independently variable abilities or group factors".

To conclude this section, it noticed that those who follow the theory of specifics differ in what are the more important factors. While Seashore, Schoen, and Drake emphasise sensory capacities, Drake and Schoen, on the other hand, recognize the importance of the intellectual side of the musical mind.

In contrast to the Theory of specifics, Mursell set forth an "omnibus theory". He sharply criticized Seashore's tests as being only measures of sensory capacities. He stated that they deal only with the response of the ear as a receptor to certain differences of the sound wave". In his opinion "music depends upon our perception of the dynamic relatedness of tones" (1937 P.300). He believes that musicality does not depend on "separate faculties"; on the contrary "it operates as a unit" ... (Ibid P.321) He concludes by designating musicality as a dynamic system which depends on "an awareness of tonal-rhythmic configuration or tonal patterns and an emotional responsiveness thereto". (P.323).

Wing is to be considered a supporter of the Omnibus theory. He stated that "musical ability and musical appreciation are qualities of the whole mind; though they involve auditory discrimination they do not depend solely on the ear." (1948 P.3). However, the "omnibus theory" of musical ability on which Wing's tests are based is supported by the evidence of the factorial analysis studies done by him (1936-1941) and by McLeish's (1950) study.

In other words the "Omnibus" theory resembles the systematic point of view of Gestalt theory in that music does not depend on parts but involves a number of inter-related behaviours. In Lowery's view, tests devised by followers of the theory of specifics may be used for the "preliminary selection of ability", while the omnibus theory applies to the "advanced stages of musical talent". (1940 P.12).

A third approach which lays more emphasis on the acquired behaviours of musical ability is described by Lundin in 1953 and 1967. He states that "musical ability is not a single trait possessed in various degrees by individuals. It consists of a number of an acquired interrelated behaviours built up through a process of interaction of individual organisms with special stimuli throughout the life history". (P.183) According to this definition, some essential capacities may be missing with some individuals and others more highly developed. Thus enabling the individual to perform certain behaviours. In other words this view tends to stress specialization, rather than listing the general characteristics of a good music listener. For example, a good piano performer, according to this theory, cannot judge a violin performance because he will not have practised fine pitch discriminations ; he may even be a mono-tone and quite unable to sing.

In the writer's opinion the main features of musical ability are present when a person can judge fine differences, appreciate good music and judge what is bad, and can benefit from musical education so as to be able to perform vocally or instrumentally.

<u>Can Musical ability be measured</u> ?

Much work has been done on the measurement of musical ability mainly for educational purposes, such as selecting musical students, or dividing students into instrumental or other groups, or guiding those who may or may not benefit from music education. There has also been interest in studying the nature of musical abilities through testing among musicians and psychologists. The tests devised by these two groups are different. Generally those devised by musicians tend to measure acquired behaviour, while those of psychologists may be aimed at innate or acquired abilities. The former mostly worked by trial and error while the latter have carried out experiments with varied batteries designed to test hypotheses. Such batteries tend to measure musical ability from different points of view according to the different theories of musical ability.

Table (4) lists the authors and the main tests and sub-tests devised by different psychologists in the field of musical ability during the present century.

Brief descriptions of these batteries follow.

A. <u>Standerdized Tests</u>

1. <u>The Seashore Test battery:</u>-

One of the earliest and best-known test batteries is that devised by Seashore and his collaborators. Throughout the past four decades, this battery (the original and its revisions) has been used by numerous investigators and given to a considerable number of testees.

The Seashore Test battery was mainly designed to measure (1) "Native and basic capacities in musical talent before training has begun ..., (2) to measure one specific capacity at a time and, (3) to make the procedure available for group measurement". (Seashore 1938 P.306).

Table (6)

Current Test In Measuring Musical Ability (1)

Name of Tests	Seashore	K-D	Drake	Wing	Bentley	Lundin	Revesz	Schoen	Lowery	Serjski & Maltzew (2)	Ortman	Mainwaring	More	Madison	Whistler & Thorpe	Franklin	Trabue	Vernon	Adler	Hevner & Landsbury	Vidor
1. Pitch (Relative	√	√		√	√		√			√	√	√	√		√						√
2. Pitch (Absolute)							√	√		√											
3. Loudness	√	√		*√																*√	
4. Rhythm	√	√	√		√		√	√		√	√	√			√						√
5. Time	√	√									√		√								
6. Timbre	√	√																			
7. Tonal Memory	√	√	√	√	√		√		√	√	√	√	√		√						
8. Chord Analysis				√	√		√			√	√										
9. Rhythmic Accent				*√																*√	
10. Harmony				*√																	
11. Phrasing				*√					√											*√	
12. Music Discrimination																					√
13. Interval Discrimination			√			√	√					√		√							
14. Retentivity			√																		
15. Intuition			√																		
16. Melodic Transposition						√															
17. Mode Discrimination						√															
18. Melodic Sequence						√				√											
19. Rhythmic Sequence						√															
20. Tonal Movement		√																			
21. Melodic Taste		*√	*√					*√									*√	*√	*√	*√	*√
22. Pitch Imagery		√											√								
23. Rhythmic Imagery		√											√								
24. Cadences									√												
25. Tonal Musical Talent																√					
26. General Knowledge	√	√		√																	
27. Questionnaire	√	√		√																	

* Appreciation judgment

(1) With some tests mentioned above, the mark (/) is only indicative of what is required from the subject, and the name of the test is different from those mentioned.

(2) Other tests in which the subject has to sing or complete a melody are not included in the table.

In the original form (1919), the Seashore tests consisted of six measures presented on phonograph records:

1. Pitch:- Seashore (1919) defined pitch as "The raw material of music" (P.8) He argues that the functioning of higher capacities in music depends primarily on the degree of pitch sensitivity, which will differ from one individual to another.

   In the sense of pitch test; two pure tones are sounded consecutively and the subject is asked to state whether the second is higher or lower than the first. The differences are gradually decreased and the smallest is 1 c.p.s.

   In the 1939 revision, the test remained the same, but a pure tone of frequency 500 is used as a reference note. And in the 1960 revision the smallest difference used is 2 c.p.s.

2. Time: Seashore states that "the sense of time is basic for all perception of rhythm and for rhythmic action. A limitation in this capacity for hearing time sets a corresponding limitation upon feeling, thought, and action". (P.9 1919).

   In his test (1919) three clicks were given; the subject is asked to state whether the interval of time between the second and third is longer or shorter than between the first and second. In the 1939 revision, two tones of different duration are heard and the subject is asked to judge whether the second is longer or shorter than the first. Time differences range from 0.30 to 0.05 second. In the 1960 revision the test remains the same as that of the 1939 revision.

3. Intensity: "the sense of intensity", Seashore states," is basic for the hearing of musical expression and appreciation of touch, and for modulation in intensity or loudness and volume".

In the early form of this test two tones were sounded which differed in physical intensity and the subject has to indicate whether the second is louder or softer than the first. The tone used was 440 c.p.s. In 1939 and 1960 the same reference tones are used and the differences in intensity are graded starting as 4.0 decibels and the least difference is 0.5 decibels but the test is known as the "Loudness test".

4. Consonance: Seashore differentiated between harmony, consonance and melody. He stated that harmony and consonance are very similar in that they deal with notes sounded simultaneously, but differ in that consonance deals with the relationships of two notes while harmony deals with more complex sounds. Melody and consonance are different in that the former deals with a sequence of tones while the latter deals with simultaneous tones. To measure the sense of consonance, Seashore included a test in the early form in which two intervals are sounded, and the subject is asked which pair blend better.

In the 1939 and 1960 revisions, a test of timbre replaced the consonance test. It is designated to measure an individual's capacity to discriminate between complex sounds which differ only in their harmonic structure or over-tones. In each pair the subject has to judge whether the tones are the same or different in timbre or tone quality. In half of the items, the difference is due to increases or decreases in the third or fourth harmonics, while in the other half the harmonics remain constant.

5. Memory: Seashore stresses the importance of memory which as he states "enters indirectly into the stages of hearing, feeling and rendering of music". (1919 P.12).

In the original and the two revised forms, the memory test includes pairs of tonal phrases (which do not form a melodic line). The subject is asked to identify by number the tone which differs in the second playing. The numbers of tones in the phrases are 3, 4 or 5, arranged approximately according to difficulty.

6. Rhythm: Seashore stated that the sense of rhythm primarily depends upon the sense of time, intensity and mental imagery. In addition it requires a number of effective motor qualifications.

In all three forms, of the rhythm test, two pairs of rhythmic patterns, which are determined by the number and temporal separation of the pulses, are produced and the subject has to judge whether the two patterns are the same or different.

Reliability of the Seashore Measures of Musical Talent:

Many empirical studies were carried out using the 1919 version in which the authors reported reliabilities of the different sub-tests. The results of these studies are summarized in table (5) below.

Examination of this table shows that the least satisfactory reliabilities were obtained from the consonance test, which Seashore therefore dropped from his test battery in the 1939 and 1960 revisions. The figures for the rhythm test are also rather low. The Memory and the Pitch tests appear to be the most satisfactory.

Table (5)

Reported Reliabilities of Seashore Measures of Musical Talent (1919 Version)

Authors	Date of Res.	Subjects	Method Used	Tests					
				Pitch	Intens.	Time	Conson.	Rhy.	T.Mem.
1. Gaw, E.A.	1925	1 Music Student	R.T.	.90	.55	.46	.49	–	.90
				.73	.94	.56	.57	–	.88
		2 Normal School Students	R.T.	.88	.75	.45	.68	.50	.67
2. Peterson, J.	1926	1 White College Students		.77	.65	.62	.52	.45	.80
		2 Coloured Students	R.T.	.68	.60	.50	.54	.43	.67
3. Lanier, L.H.	1927	100 College Students	S/H	.84	.67	.54	.33	.35	.74
			R.T.	.70	.66	.53	.32	.50	.66
4. Ruch, G.M. & Stodard, G.D.	1927	210 College Students	R.T.	.71	.65	.48	.43	.29	.59
5. Brown, A.W.	1928	108 Junior and Senior-High School Students	R.T.	–	–	–	.36	–	–
6. Larson, D.L.	1928	Normal School Students	R.T.	-.02	.43	–	.37	–	–
7. McGinnis, E.M.	1928	Pre-School Children	R.T.	.76	.50	.52	.53	–	.83
8. Highsmith, J.	1929	59 Music College Freshmen - Girls	R.T.	.70	.68	–	–	–	–
9. McCarthy, D.	1930	School Children, Junior-High and College Students	R.T.	.83	.80	.59	.55	.56	.87
0. Larson, R.C.	1930	1 Two groups of Eight-Graders (200 & 100 respectively)	R.T.	.85	.83	.62	.54	.59	.88
			R.T.	.90	.78	.69	.57	.54	.90
		2 Seventh-grade subjects	R.T.	.82	.83	.80	.57	.42	.84
		3 Sixth-grade subjects	R.T.	.84	.81	.85	.36	.46	.84
		4 Fifth-grade subjects							
1. Farnsworth, P.R.	1931	Four different groups from Iowa, the reliabilities	S/H	.74	.72	.41	.33	.43	.83
		ranged from:	R.T.	.75	.61	.46	.36	.47	.81
			R.T.	.66	.86	.81	.52	.64	.88
2. Mursell, J.	1932	176 College Students	S/H	.72	.85	.68	–	.68	.94
3. Drake, R.M.	1933	46 Music Students		.84	.88	.70	.30	.48	.86
		180 Non-Music Students	R.T.	.72	.27	–	–	–	.38
4. Sanderson, H.E.	1933	1 67-71 Polish Group	R.T.	.55	.32	–	–	–	.64
		2 74 Jewish Group	R.T.	.54	.80	.45	.62	–	.83
5. Stanton, H.M.	1935	Music Students at the Eastman School of Music		.64	.64	.58	.54	–	.90
			S/H	.60	.82	.67	.46	–	.83
				.51	.78	.66	.58	–	.90
6. Friend,	1939	42 Kindergarten Children	R.T.	.71	.65	–	.43	–	–

R.T. = Retest
S/H = Split-Half

The reliabilities for the Memory test run from .59 to .94, which is comparatively high for a short practical test. Apart from McGinnis's (1929) study, the figures for the Pitch test ranged from .51 to .90. Although quite high reliabilities are reported for the time and the Intensity tests, ranging up to .85 and .94 respectively, other writers report figures below .50.

On one research, McLeish (1950) obtained higher figures using the split-half method, when he instructed his subjects not to guess when doubtful, but instead to write E or Equal. His figures range from .65 to .86 for the (1919) tests.

Farnsworth (1931) stated that both the Pitch and Tonal Memory tests are sufficiently reliable for diagnostic value and that the others should be used with extreme caution. (P.384).

The 1939 revision has a number of advantages over the older measures. It includes two forms which differ in difficulty. Series A, is more for the general use while Series B is more difficult and could be used in testing musical groups. One of the advantages, which is noticed in this version is that the recording is much better than that of the earlier version.

The test authors provide two lists of split-half reliability coefficients for Series A and B which are comparatively higher than those reported by test users. (Table 6).

Table (6)

Tests	Series A	Series B
Pitch	.88	.78
Loudness	.88	.77
Time	.75	.70
Timbre	.74	.72
Rhythm	.62	.72
Tonal Memory	.88	.89

For the 1960 version, the reliability of the tests was estimated by means of the Kuder -Richardson formula. They were calculated for subjects in grades 4 to 16 who were classified into three educational levels. The norms for this revision were based on the same data. No adult norms are given since the authors have always maintained that the discriminations measured by the tests do not change appreciably with age. Table (7) gives the figures reported for the reliability of the tests in the 1960 Manual.

Table (7)

Tests	Grades 4-5		Grades 6-8		Grades 9-16-	
	N.of Sub.	Rel.	N. of Sub.	Rel.	N.of Sub.	Rel.
Pitch	3480	.82	2555	.84	4314	.84
Loudness	380	.85	1200	.82	4319	.74
Rhythm	3476	.67	2499	.69	4024	.64
Time	377	.72	952	.63	4316	.71
Timbre	377	.55	951	.63	4319	.86
Tonal Memory	3477	.81	2506	.84	4068	.83

The test authors emphasize the importance of interpreting scores in broad categories only. Retesting procedure could be carried on where important decisions are to be made with respect to doubtful performances.

However, retesting is not always possible for the following reasons (a) The amount of time is always a great problem in carrying out empirical studies, (b) the second performance may be doubtful if the scores increase as a result of training and (c) lower scores are also possible due to boredom, especially if the test material is not appealing to music students.

Validity of the Seashore Measures of Musical Talent:-

"Validity" as Garrett (1966) stated "depends on the fidelity with which it measures whatever it purports to measure". (P.354).

There are different opinions concerning the validity of the musical talent tests presented by Mursell and Seashore. The latter (1938) stated that the validity of his tests, which represent the theory of specifics, is "an internal validation in terms of success in the isolation of the factor measured and the degree of control of other factors in the measurements", (P.384). He adds that scores in his measures should not be averaged but should be used to indicate the degrees of deficency or power in specific abilities required for specific musical behaviour. He rejected concepts of validation based on the "omnibus" theory, i.e. using acquired musical behaviours such as sight singing or performing an instrument ... etc., as an external criterion. Hence the methods suggested by Mursell are rejected by Seashore.

However, most of the test users have concerned themselves with validation in this sense, using as criteria of validity grades in applied music and theory courses; and low figures are always reported. Most of the studies carried out used the 1919 version of the tests. Seashore, however, "accepted the results reported by Stanton" although she used the rejected criterion (Wyatt 1939).

One of the studies was carried out by Stanton between 1921 and 1931 at the Eastman School of Music using graduation as the criterion of success. She applied a combination of tests including five of Seashore's, an intelligence test (Iowa Comprehension test, a tonal imagery test and a case history, and on the basis of these scores she classified the students into five categories "discouraged, doubtful, possible, probable and safe". Her results indicate that (a) some students from all categories dropped out before graduation; (b) 17% of the "discouraged" group, 32% of the doubtful group, 33% of the possible 42% of the probable group and 60% of the safe group graduated in the normal time.

This study has been criticised by Mursell (1937). He stated that the result obtained is not only dependent on the Seashore tests but also on the other predictors. So "it is evident that from the results so presented we can draw no conclusions whatsoever as to the predictive value or validity of the Seashore battery ....." (P.297). On the other hand, Farnsworth (1951) indicated that such a procedure greatly improved the quality of the student body; and Lundin (1958) suggested that Stanton's work should be repeated using the revised version with other music tests such as Drake's and other measures, in order to present the specific contribution of music tests, intelligence and case history.

Another extensive study was carried out by Taylor (1941) at the College of Music Cincinnati during the years 1930-1935. His subjects were 150 freshmen students in the college. He gave the Seashore tests, K-D tests and 4 other tests devised by himself. To validate these 22 tests, he used instructor's estimates of the student's talent; marks in sight singing and dictation courses and scores on an intelligence test. The correlations obtained (included in tables 8 and 14) are quite low. However the low figures may be due to the unreliability of the external criterion used.

The results obtained from empirical studies carried out to validate the Seashore tests are summarized in Table (8) below.

The examination of table (8) shows that the two tests which gave the best reliability also show the highest correlations with the criteria. The highest is .80 for pitch obtained in the study of Highsmith (1929) and the highest figure obtained for the Memory test is .83 obtained in McCarthy's study (1930). The figures obtained from other tests are comparatively low and the lowest is that obtained from the consonance test.

Another method of validating Seashore's tests was used by McLeish (1950), namely an internal criterion of validity based on factor analysis and regression analysis, and external criteria in the form of other standardized tests of musical appreciation and ability, namely Wing's and the Oregon tests, question responses and non-musical tests. McLeish declared that "neither Seashore's view as to the specific nature of musical abilities, nor his critics view as to the atomistic and irrelevant character of his test could be upheld". When comparing the results obtained by Seashore's test battery with that obtained from Wing's, he concluded that "the Wing Tests measure much the same kind of ability as Seashore's but measure it at a higher or at least different level, namely, that of musical meaning". In his opinion "the Seashore will be most effective if the scores are weighted in accordance with the calculated regression coefficients and if used in conjunction with other tests of musical appreciation". (In Buros 1953 P. 343).

Table (8)

Validation Studies Done on Seashore Measures of Musical Talent (1919) Version

Authors	Date of Research	Subjects	Criterion	P	I	T	R	C	T.M.	Total
1 Smith, F.O.	1914	234 Boys	Teacher's rating on Sight Singing	.71						
		274 Girls		.51						
2 MaLamberg, C.F.	1918	10 Trained subjects	1 Training judged by questionnaire					.02		
			2 Ability to perform judged by questionnaire					.06		
3 Seashore, C.E.& Mount, G.H.	1918	College students	Musical training as estimated by questnre	.31						
4 DeGraff, L.H.	1924	464 Adults	1 Music lessons				.09			
		282 Eighth-grade students	2 Music lessons				.10			
		272 Fifth-grade students	3 Music lessons				.21			
5 Mosher, R.M.	1925	450 Students	Music achievement scores	.44	.49	.36		.29	.44	
6 Seashore, R.H.	1926	Music students	Learning Rhythm				.82			
7 Brennan, K.	1927a	100 Music students	Singing intervals and singing in key	.21-.38					.22-.50	
8 Brennan, K.	1927b	20 Music students	1 Teacher's ratings on performance	.27	.17	.23	.47	.28	.47	
			2 Amount of training	.40			.14	.02		
9 Brown, A.W.	1928	108 Junior and Senior-High School students	Ratings of teachers in musical aptitude	.15	.11	.15	.17	.17	.41	
10 Gaw, E.A.	1928	149 Subjects	Sight singing	.46	.36				.56	.22
11 Tierney, E.M.	1928	Freshmen students	(His) achievement tests							.45
12 Wright, F.A.	1928	52 Music students	1 Piano performance							.51
			2 Music dictation							.73
			3 Music dictation at the end of 1 year						.10	
13 Highsmiths, J.	1929	.59 Music College Freshmen(G)	1 Grades in applied music	.80	.33	.26		.04	.14	
			2 Grades in music theory	.41	.35	.30		.23	.65	
14 Salisbury, F.S.& Smith, H.R.	1929	144 Normal School Students	Sight Singing	.60				.41	.40	
15 McCarthy, D.	1930	71 Children in 5th & 6th grades	Voice Grades	.43	.33				.83	
		58 University students	Music questionnaire	.57	.31			.21	.68	
		33 University students	Music questionnaire	.60	.23					
16 Wilson, M.E.	1930	Music students	Average of grades from courses of -							
			1 Applied Music							.21
			2 Ear Training							.42
			3 Theory							.21
			4 Appreciation							.26
			5 Teaching courses							-.02
			6 T.Average of grades							.25

Table (8) Cont.

Authors	Date of Research	Subjects	Criterion	Tests P	I	R	T	C	T.M.	Total
17 More, G.V.D.	1932	179 Freshmen girl students at N. Candina College of Music	Average music marks	.41	.07	.13	.22	.01	.45	
18 Mursell, J.	1932	176 University students of whom 88 were music students	1 Ratings of teachers in musical aptitude	.11	.07	.20	.25	-.27	.19	
			2 Piano final grade	.01	.09	.10	.20	-.25	.07	
			3 Voice final grade	.07	.08	-.14	.06	.06	.05	
19 Chadwick, J.E.	1933	39 Music students	Sight Singing							.84
20 Drake, R.M.	1933	46 Music students* (A)	Teacher's ranking of Music students	.27	.05	.14	.08		.33	
		40 Music students* (B)	Teacher's ranking of Music students	.31	.14	.28	.36	-.03	.41	
21 Larson, W.S.	1938	Students from Eastman School of Music	Music Theory							.59
22 Taylor, E.M.	1941	163 Music students (Col.level)	1 Dictation grades	.02	.29	.27	.21	.25	.26	
		161 Music students (Col.level)	2 Sight singing grades	.12	.33	.17	.14	-.05	.23	
		160 Music students (Col.level)	3 Harmony Grades	.07	.02	-.05	.26	.10	.15	
		123 Music students (Col.level)	4 Grades in History	.06	.05	.12	.10	.06	.07	
23 Tilson, L.M.	1932	240 Music students and 142 Non-Music students	Ear training and Sight singing							.40

* The number of students is not the same for the individual tests but ranges 26-28 in Group A and 38-40 in Group B.

Manor (1950) used the 1939 version of the tests. He found that fourth grade work in instrumental music could be forecast by the Pitch test with a coefficient of correlation of .49 and by the measure of tonal memory with a correlation value of .32.

Another user of this version is Wing who tested 150 students and took teachers' judgments as his criterion. He obtained a coefficient of .40 with the total of the Seashore tests. He stated that "it should be borne in mind that the reliability of the tutors' judgments is not high and the group is so highly selected that even this low figure can be taken as indication that the test has some value. In general, results obtained in testing were certainly more satisfactory than results obtained with the earlier form of the tests". (Wing: in Buros 1953).

Farnum (1950) reported the following coefficients when using the 1939 Seashore tests as criteria of musical performance. Table (9) shows the reported validity coefficient with three different groups from the Farnum test.

Table (9)

Groups	Pitch	Loudness	Rhythm	Time	Timbre	T.Memory
1. 75 students	.47	.18	.12	.21	.09	.34
2. 67 students	.43	.28	.20	.44	.11	.31
3. 59 students	.69	.35	.20	.32	.05	.38

It is noticed that the pitch, time, and tonal memory tests give the highest correlation coefficients with the Farnum test, which suggests that these three abilities are particularly required in performing the Farnum test.

In a recent study by Roby (1962) using the latest version of the Seashore tests, with 77 subjects, reported low figures when correlating the total scores and individual tests with marks in music theory. The figures reported range between - .134 for the memory test and .038 for the loudness test. With the Seashore total score, the validity coefficient reported was - .055. With another group of students (N = 101) the pitch test gave .187 with the same criteria. Roby declared that "there is no relationship between the theory grades and the Seashore battery scores .... and the use of these tests in prognosticating success in music theory at the college level is about the same as using any chance method of prognosticating", (P.141).

He suggests that predicting success in music should be approached in the same way as success in fields other than music is predicted i.e. through achievement tests which measure whether the child has grasped more or less than the other students.

Rainbow (1965) used three of Seashore's revised tests together with other variables to determine the constucts of musical aptitude. His criteria were (1) the teachers' estimates of potential talent in music, (2) musical achievement scores and (3) Musical Training scores. (Table 10) gives the results obtained from this study.

He indicated that "the moderate positive correlations with the criteria, suggest that with regard to each of these characteristics or abilities, the aptitude group classifications overlap". (P.13).

Table (10)

Criterion	N. of Subjects	Pitch	Tonal Memory	Rhythm
1. Musical talent.	(a) 91 junior students in grades 4-6	.112	.357	.269
	(b) 112 students in grades 7-8	.448	.400	.209
	(c) 88 students in grades 9-12	.448	.498	.118
2. Musical Achievement.	As in a	.259	.336	.323
	As in b	.551	.525	.263
	As in C	.630	.353	.289
3. Musical Training	As in a	.137	.219	.250
	As in b	.006	.073	.158
	As in c	.354	.369	.071

From this review, it appears that when the tests are validated against some general external criterion of musical performance, the tests of pitch, rhythm, and tonal memory are the best. But when the Seashore battery is used as a predictor to indicate how far a student can profit from music instruction, the results are so inconsistent that no prediction can be made. Goodnough (1949) stated that "those subjects who do very poorly on the tests are very rarely able to become more than very mediocre performers, even under tutelage and faithful practice. But exceptionally high scores appear to be more closely related to keen sensory perception than to high musical talent." (p.345).

In the present study, four of the Seashore tests (1960 revision) were applied to 175 children with agerange of 9-15 and 231 adults with age range of 15+ to 21+. In validating the Seashore tests, the teachers' ratings in different music subjects at the different schools from the 2nd term examinations were used as criteria. (See Chapters 7 and 8). The following table (11) summarizes the validity coefficients.

Table (11)

Subjects	Criteria	P.	R.	T.	T.M.	Total
1. 111 children in General Preparatory School	1 Performing (1st Instrument)	.12	.14	.25	.35	.30
	2 Music Theory	.13	.15	.13	.25	.23
	3 Sight Singing	.12	.16	.21	.28	.27
2. 74 Children in the National Conservatory of Music	1 Performing (1st Instrument)	.52	.43	.40	.56	.64
	2 Music Theory	.28	.39	.23	.29	.38
	3 Sight Singing	.51	.14	-.12	.14	.28
3. 171 subjects in Teacher's Training Schools (Music Sec.)	1 Accordian Playing (1st Instrument)	.03	.15	.19	.14	.24
	2 String-Insts. (2nd Instrument)	.02	.12	.17	.16	.22
	3 Music Theory	.22	.23	.38	.14	.38
	4 Sight Singing	.09	.10	-.08	.04	.02
4. 24 students in the National Conservatory + 36 students from the Higher Institute of Music.	1 Performing (1st Instrument)	.19	.02	.24	.17	.24
	2 Sight Singing	.32	.17	.09	.45	.33
	3 Harmony	.18	.19	.09	.20	.23

In each sub-groups, some of the coefficients are not significant and generally are rather low. This may be due, however, to the nature of the criteria used, which Seashore regarded as inappropriate. These tests have been criticised by many psychologists such as Heinlein, (1925), Brennan (1926); Brown (1928); Highsmith, (1929); Vernon (1935); Mursell (1932), More (1932), Farnsworth (1935), Wing (1936) and Roby (1962). They emphasize (a) the failure of the tests to predict success as estimated by teachers; (b) the low reliability and validity coefficients; (some say that intelligence or other tests show better validity (1))(c) that the tests measure only sensory capacities and the test material is not related to music. Musicians too have criticised the tests as being essentially unmusical.

Mainwaring (1947) argued that underlying such tests is the assumption that all musical experience, whether that of a listener, a performer, or a composer, implies at least a developed efficiency in such perceptual discrimination. It does not follow from this assumption that superior perceptical ability of this kind is sufficient to imply general aptitude for musical training.

But in spite of these criticisms are levelled against the tests, many teachers in America still use them. As indicated by Pinkerton (1963) 19 out of 70 schools in the U.S.A. use them in the selection of students, that is as high a proportion as those who use tests devised by music teachers.

(1) Chadwick, (1933) came to a different conclusion, stating that "In determining probable success in music, musical talent tests are about two and one half times as indicating as intelligence tests, and twenty-five times as effective as tests of general knowledge of school subjects".

Wing concludes that although there is an experimental evidence concerning their weakness for predicting musical ability, "it is essential that the atomistic approach should be used". (Wing 1948 P.10) And Lundin stated (1959) "despite the barrage of attacks against the tests ..... and regardless of what any individual's personal opinions may be .... the oldest of all musical aptitude tests has stood the test of time". (In Buros 1959).

The Kwalwasser - Dykema Music Tests

In 1930, the K-D tests were published. The battery consists of 10 sub-tests which are considered as being measures of musical talent. Six of these tests are very similar to those of Seashore, as follows:-

1. Pitch: 25 items in which the subject has to indicate if a single tone does or does not alter. The rising or falling of the tone ranges betwen 15 and 6 c.p.s.

2. Quality discrimination: (timbre) includes 30 items, each played on one instrument. These are immediately followed by the same notes played on either the same or a different instrument. The subject has to indicate if the two playings are the same or different.

3. Tonal Memory: pairs of tonal patterns; the shortest consists of 4 tones and the longest of 9 notes. In its 25 items, the subject tells whether the second pattern is the same or different from the first. The instrument used to provide the test material is the piano.

4. Loudness: Intensity discrimination is measured by 15 single tones and 15 chords which are repeated at different intensities; the differences range from very marked to very slight. The subject has to

judge whether the second tone or chord is stronger or weaker than the first.

5. Time discrimination: 25 items of 2 consecutive tones which are to be compared as to duration. The subject is asked to judge if they are the same or different. The temporal variation ranges from 0.03 to 0.30 seconds.

6. Rhythm Discrimination: 25 pairs of rhythmic patterns are to be judged as similar or different.

The other 4 tests included in the battery deal with learned behaviour and musical feeling and appreciation. In the Tonal Movement test, the subject is asked to indicate whether the last tones in a recorded melody should be higher or lower. In other words, the test is trying to measure the listener's ability to indicate correct musical endings. In the Melodic Taste Test, the subject is asked to judge which of the two responsive phrases is a more appropriate ending to an initial one. In two tests dealing with Rhythmic and Pitch Imagery (1) the subjects have to compare the rhythmic and tonal patterns which they hear with those printed on their answer sheets.

The manual for the tests does not give data on the reliability or validity of the tests, but percentile norms are provided for each test and the total scores for 3 different levels.

Lundin (1967) summarized the studies carried out on the reliability and validity of these tests. The results of these investigations are included in tables (12) and (14) below. (From Lundin 1967 P.247 and 248)

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(1) Similar tests were devised for the present investigation. See Chapters 4 and 5 below.

Table (12)

Reliability Coefficients for the K-D Battery of Music Tests

Investigator	Date of Research	Method	Pitch	Intens.	Qualty.	Time	Rhythm	Tonal Mem.	T.Mov.	Melodic Tests	P.Imagery	R. Imagery
1. Farnsworth, P.	1934	R.T.	-.05	-.10	.53	.42	.21	.73	.55	.53	.42	.40
		S/H	.63	.60	.36	.63	.28	.63	.85	.28	.33	.20
2. Sanderson, H.E.	1933	R.T.	.34	.07	.20	.19	.27	.43	.37	.10	.14	.31
		R.T.	.38	.12	.10	.11	.04	.53	.38	.06	.28	.27
3. Manzer and Morowitz	1935	R.T.	.18	.15	.32	.43	.48	.73	.69	.52	.45	.38
4. Whitley, M.T.	1932	S/H	.27	.27	.25	.33	.23	.46	.67	.19		
5. Drake, R.M.	1933	S/H	.39		.39		.30	.57	.73	.40		
					.66			.55	.85	.61		
6. Bienstock, S.F.	1942	R.T.		.35	.45	.00 (1)	.39	.52				

R.T. = Re-test S/H= Split Half

(1) Bienstock reported .09 reliability coefficient for the time test. (1942).

The reliabilities of the tests reported in table (12) are rather lower than those of the Seashore tests. In other studies, not reported by Lundin, Wiener (1936) gave the K-D tests again after an interval of one year, to 100 students at the High School of Music and Art in New York. The correlations reported are as follows, T.Memory .56; Quality Disc., .40 ; Time Disc., 50. The reliability of the T.Memory test was recalculated after eliminating scores which caused skewness. Wiener concluded that this does not seem to increase the reliability of test I (T.Memory) but, in fact, decreases it." (In Bienstock 1942 (a) P.428).

An examination of the reported reliabilities shows that the Tonal Memory test has the highest reliability coefficients. Both Farnsworth (1934) and Bienstock(1942)stated that the tests are too unreliable for the prediction of individual musical abilities.

Since the first six tests claim to measure the same abilities as Seashore's, some studies have reported the correlation coefficients of corresponding tests. Table 13 shows the figures reported.

Table(13)

Correlation coefficients of Seashore and K-D tests

Investigation By	Date of Research	P.	R	I	T.M.	T
Farnsworth, P.,	1931	.17	.24	.03	.62	.38
Tilson, L.M.,	1932	.14	.22	-.12	.32	.40
Whitley, M.T.,	1932	.49	.43	.38	.71	.55
Sanderson, H.E.,	1933	.43		.27	.48	

Farnsworth indicated that except for tonal memory, the tests from the two batteries do not measure precisely the same variables.

.Holmes (1954) reported higher reliabilities for the K-D test battery after revising the tests. He included some new directions which helped to reduce the element of chance and accordingly allowed for finer discrimination of the stimuli. The reported reliabilities are as follows: .73 for T.Memory; .88 for Tonal Movement; .50 for time; .71 for rhythm; .70 Quality Discrimination; .79 for Intensity; .72 for Pitch; and .43 for Melodic taste. The two Imagery , tests were omitted from this revision. A reliability coefficient of .91 was reported from the total scores of the eight tests.

The Validity of the K-D tests

A number of studies have been reported in which the K-D tests have been used to forecast certain musical performances. Some of these have been included in table 14,(From Lundin 1967 P.248). Taylor's study may be considered as an important investigation since it was carried out over a long period, (1930-1935,)and may be compared with that of Stanton on the Seashore tests at the Eastman School of Music. His battery, used for student guidance, included the Seashore tests, the K-D tests, and a "g" test. His results show that the "aptitude tests did not evidence sufficient predictive value to be used by themselves in guidance".

Bienstock (1942) also reported that the tests are not reliable in the prediction of individual success, and that intelligence measures were the best predictors.

Briggs (1938) administered the K-D tests to two groups of children who had been classified by their teachers as "best" and "worst" in sight

Table (14)

Validity Studies Reported for the K-D Tests

Investigator	Date of Research	Criterion	P	I	Q	T	R	TM	TMD	MT	PI	RI	Total
1. Chadwick, J.E.	1933	Grades in Sight Singing	.01	.28	.19	.02	.08	.32	.31	.23	.32	.34	
			.18	-.11	.14	.27	.17	.14	.24	.31	.29	.46	
2. Drake, R.M.	1933	Teacher's ranking in	.23		.17			.43	.15	-.13			
		Music Schools	.00		.14			.25	.23	-.10			
3. Bienstock, S.F.	1942	Average Theory Grades		.02	-.01	-.13	-.02	.19					.02
				.16	-.10	-.06	.16						.16
		Music Performance		.12	.05	-.12	.31	.26					
				-.09	.09	.01	.20	.28					
4. Tilson, L.M.	1932	Grades in sight-singing	-.12	.17	.21	.03	.19	.40	.23	-.19	.19	.39	
5. Taylor, E.M.	1941	Marks in sight-singing	-.18	.14	.10	-.07	.16	.28	.06	.06	.34	.08	
		Marks in dictation	.06	.29	.21	.06	.09	.45	.10	.12	.59	.25	
		Marks in harmony	.02	-.07	.00	.00	-.04	.02	.00	-.03	.00	.01	

singing. The children in the "good" group made a total average score of 184.4; while those in the poor group reached an average of only 168.0.

Lambert (1941) reported similar but poorer results. He obtained an average score of 181.61 from the best five sight-readers in in their class and 170.57 from the worst five sight readers in their class.

Lehman (1950) compared the mean scores obtained by 225 music teachers with that obtained from the same number of college students, who learned a musical instrument for some time but had discontinued their musical training. The first group's mean score was 228.48 as compared by 202.41 obtained from the second.

Franklin, (1956) criticised the K-D tonal movement test as being incomplete since the items are short and its length not sufficient to produce a melodic idea. He therefore developed a similar Melodic Taste test which "merits a favourable judgment in the sense that it is a step in the right direction considered as a test of musical talent". (1956 P.104).

However, Farnsworth (1934) after reviewing the reliability of the K-D tests concludes that they are "too unreliable for individual prognostication ... (P.60).... (and) quite inferior psychologically to the older Seashore tests, (P.83).

The Kwalwasser Music Talent Test

Kwalwasser's new test appeared in 1953. A single test include items measuring different abilities namely (1) loudness discrimination; (2) pitch discrimination; (3) rhythm discrimination; and (4) time discrimination. The test requires only 10 to 15 minutes for administration. There are two forms, A and B, in which A is difficult enough for senior college students while form B is to be used with junior high students.

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No reliability or validity is reported by the author. In a study by Bentley (1955), a reliability coefficient of .59 was reported as calculated by Kuder-Richardson formula.

Drake's Musical Talent test:

Drake's test battery includes four tests designed to measure (1) Musical memory: in which 24 pairs of two bar melodies are played. In the second member of each pair there may be a change of key; change of time; change of note; or the same melody repeated. Only one of these changes occurs in any one item. The subject is told to identify each variation, or to say whether the second is the same as the original melody. This test is given on the piano.

(2) Interval Discrimination: 80 pairs of intervals are played on the piano. The subjects are asked to identify whether the second of three intervals in each pair is larger or smaller than the first.

3. Retentivity Test: this test is constructed to measure memory for more elementary components of melody than melody itself. It is a measure of absolute pitch or memory for isolated tones. It consists of 20 trials, each trial of two sections. In the first section, the subject hears a musical interval on the piano, then a metronome beating, then a sequence of three notes. These three items the subject is asked to keep in mind. In the second section of each trial the person hears another musical interval and he is to judge whether it is larger or smaller than the interval he heard in section one. Following this he hears the beating of the metronome and has to judge whether the rate of beating is faster or slower than the rate in the first section.

4. Intuition: "This test attempts to measure some of the more subtle aspects of musical talent .... i.e. to supply an answer to a given unfinished theme. The successful accomplishment of this task is said to depend upon an intuitive feeling for three things: (1) phrase balance, (2) key-centre and (3) time balance.

Drake reported reliability coefficients for his tests as follows:-

1.	Self reliability for Test 1	.93	(46 Musical Subjects)
2.	Split half " " " 2	.83	(Music students)
	" " " " " "	.43	(Non-music students)
3.	" " " " " 3	.61	(Musical group)

The Validities as reported by Drake (1933) are shown in table (15).

Table (15)

Tests	Subjects	Criteria	Validity Coefficients
Musical Memory	46 Music students	Teachers estimates	.671
Interval Discrimination	Musical and Non-Musical Subjects	" "	.350
Retentivity	Musical Group	" "	.394
Intuition Total	40 Music Students	" "	.304
Key Centre	"	" "	.240
Time-Balance	"	" "	.290
Phrase-Balance	"	" "	.190

In the revised version of Drake's tests (1957), two tests only are included in the battery namely, Musical Memory and Rhythm.

The memory test similar to that of the early revision, but is increased in difficulty by increasing the number of phrases to be compared in one item, (as many as seven). There are two forms of the test. Farnsworth, stated that these two forms "correlate slightly" i.e. .55 (1958 P.243).

In the rhythm test, the subject hears a tempo established by the beating of a metronome. At the same time, the announcer counts. A period of silence follows in which the subject has to count at the same speed until ordered to stop and then writes the number he has arrived at. There are also two forms of this test which could be used separately or combined.

The reliabilities of the tests are high and rise to between .80 to .90. Drake did not include a measure of pitch discrimination in his revised battery although he stated (1939) that a pitch test should always be included in any music testing programme.

<u>The validity of the tests</u>:- the correlations with teachers' estimates reported by Drake (1957) vary considerably, depending rather on the sample used. The coefficients range between .31 and .91 with a median of .58 for both tests.

Drake reported low correlations between his rhythm test and that of Seashore's, .02 to -.11; and Lundin (1949) obtained a correlation coefficient of .58 between Seashore's Memory and the early Drake memory test.

Lundin (1949) compared the scores made by music students in different acquired musical abilities with that of Drake's Memory test, and his own tests (see P 93 below). The figures reported for the

Drake test were as follows:-

With melodic dictation .50; Harmonic dictation .45; Written harmonization .36; General ability in theory .42; Performance .09 and with the total of these tests .47.

Generally, Drake's rhythm test is the only available test which measures the ability to keep in time, while the memory test has quite a consistently high validity compared with most other published tests.

<u>The Wing Standardized Tests of Musical Intelligence:</u>

The aim of Wing's research, carried out over a long period and published in his two main works (1936 and 1941), was to devise a series of tests which would estimate musical "perception" and musical appreciation in a form which could satisfy both musicians and psychologists.

In the original form (1939) the test battery included seven tests which were recorded on seven phonograph records. In the (1960) revision the tests were produced on a two-side magnetic tape. In this battery, tests 1-3 deal with aural acuity the subjects are asked to: detect the number of notes in a played chord; to say whether a note rises or falls when a chord is repeated with one note changed; and to say which note of a repeated melody is changed. (See Chapter 5 below for further description of these three tests.).

The four tests which deal with musical appreciation are as follows:-

1. <u>Harmony appreciation:</u> The subject has to state which version of two harmonizations to a tune he prefers.

2. Intensity appreciation: The subject has to judge the more appropriate mode of varying loudness in two versions of the same melody.

3. Rhythm appreciation: the subject has to state which is the more appropriate rhythmic accentuation in two versions of the same melody.

4. (Test No. 7): Phrasing appreciation: the subject chooses between a balanced and unbalanced phrasing.

On the answer sheet test, the subject also has to give information about his environment, to specify the instruments he plays and the amount of time he plays this instrument, and say if he has had any music lessons privately.

The Reliability of the tests

As the tests are designed to select those of high aptitude for the study of instrumental music, the author emphasizes that the reliability of the tests should be worked out with groups "of reasonably high aptitude." Wing reported a reliability coefficient of .90 for the total battery using the split-half method with data obtained from a group of 100 music teachers. McLeish, reported the same figure in his 1950 study, but the reliability of individual tests ranged from .65 to .85. He indicated that these lower figures are not a very serious criticism of the battery, since Wing is interested in the total score rather than specific tests. The reliability coefficients reported by Wing for younger children is rather lower than with older children and run in the 70's.

Bentley (1955) reported a reliability coefficient of .86, using the Kuder-Richardson formula. He stated that this figure is ~~the~~ higher than that of other tests included in his battery.

With the test retest method Wing reported .88 when 19 subjects were tested two years apart. Cleack (1958) retested 34 subjects. He found that in seven cases, the differences between their two scores were greater than 10 and with three of these seven the differences were quite large i.e. (-42, -19, and + 20). In 13 cases the scores 1
increased and in only one case there was no difference. The reported r between test and retest scores was .76.

Validity of Wings Tests:

Wing suggested that since his tests are primarily designed to select students who wish to join school orchestras by measuring both their ear acuity and sensitivity to performance, the criterion of validity should be, as far as possible, "against instrumental performance". (1962).

He (1948) reported the following validity coefficients for the total battery against teachers' rankings.

(1) .64 (N= 45 girls;)(2) .78 (N= 15 boys and girls) (3) .82 (N= 45 boys), (4) .90 (N= 6 adults) and (5) .77 (N= 19 adults).*

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* (1) The teachers estimates were from sight-singing , aural work and theory.
(2) Performing ability was the criterion.
(3) Performing in instrumental music.
(4) Ranking the students according to their musical ability as estimated by questionnaire.
(5) The same as 4.

In (1959) Wing reported that a validity coefficient of .73 was obtained from the intercorrelation of the total scores of his test battery and the Alferies Music Achievement test. Wing states that "if the figure were corrected for the reliabilities of the two tests, the resulting validity coefficient would be one of the highest recorded for a music test". (In Buros 1959).

In Cleack's (1958) investigation of 650 Secondary School Children the Wing tests were compared with the year's class marks. He indicated that "the correlation between Wing's figures and the class assessment is quite high ... There are some obvious and interesting differences ... and it will be interesting to see how the figures stand in (say) two years time", (P.32).

Newton (1959), gave the tests to 233 junior musicians who were graded into three groups namely, above average, average and below average. He found a positive and significant correlation between the gradings and the test results. In comparing those who did well in the tests and those who did not, he "found that of those who did well in learning to play an instrument, one out of 27 did badly in the tests and five others were on the borderline .... and of those who proved disappointing, there were two out of 28 well over the borderline on the test and four others who were borderline candidates", (In Wing 1962 P.45).

Richardson (1959) used the Wing test results in comparing assessments of music and non-music specialists. He found that the test results agree with assessments of specialized music teachers and "very little" with those of non specialists.

The Validity of the tests has also been studied by using factorial analysis. Wing (1941) found a general factor of musical ability which accounted for 40% of the test variance. (See Chapter 3 below). McLeish (1950) also reports a general factor which grouped the Wing tests (40% of the variance) and identified this as the "cognitive aspect of musical ability" in which memory and pitch change had the largest saturations and which may be considered as "the important constituents of musical ability as defined factorially". (In Buros 1953).

In the present investigation, the criterion used to validate tests 1-3 of the 1960 revised version of Wings battery, is teachers' estimates in musical subjects. The figures obtained are as follows:

Table (16)

	Subjects	Criterion 2nd Term's Marks in	Tests Chord Analysis	Pitch Change	Tonal Memory	Total of 1-3
1.	171 students in Teacher's Training Schools. Music Section.	1. Accordian Performing	.04	.13	.25	.20
		2. Strings Performing	.02	.21	.27	.26
		3. Music Theory	.20	.21	.12	.22
		4. Sight Singing	.05	.02	.15	.12
2.	60 students at the H.I. of Music and the N.C.	1. Performing (first Instrument)	.23	.40	.35	.37
		2. Sight Singing	.32	.54	.49	.55
		3. Harmony	-.08	.20	.35	.22

Generally, the figures obtained are rather low if compared with those reported by Wing and other investigators. However the subjects' performance on both tests 1 and 2 showed that these are rather difficult mainly because the test material is unfamiliar to oriental subjects. The higher figures obtained from the memory test confirm this idea since the test is mainly based on one line melodies, which are nearer to the nature of oriental music.

Generally, and apart from the results obtained in this investigation, the Wing tests have proved to be a very suitable test battery which could be used in the selection of musically talented children for training.

Bentley's Measures of Musical Abilities

On the assumption that no tests are available to measure the musical abilities of young children, Bentley devised his test battery for group testing of children with age range of 7 years to 12. The battery consists of four measures, namely Pitch discrimination, Tonal and Rhythmic memory, and chord analysis. The first three tests are very similar to those of Seashore while chord analysis is like Wing's test. The battery needs only 21 minutes for administration, which is an advantage with younger children in avoiding fatigue and boredom. For further description of the tests, see Chapter IV below.

Reliability of the Bentley tests:-

Bentley tested a group of 90 unselected boys and girls whose ages ranged from 9 years 10 months to 11 years 9 months; their mean age was 10 years 9 months. Four months were allowed between the two testings. The correlation coefficients between the two testings are as follows: (In table 17)

Table (17)

Pitch	T.Memory	Chord Anal.	R.Memory	Full Battery
.745	.530	.710	.570	.84

He stated that all these reliability coefficients are significant at the .01 level, and the figure of .84 may be regarded as satisfactory for a battery in which the number of items is only 60. He concluded that "the tests are reliable and not unduly subject to chance and guessing". (1966 P.89).

Validity of Bentley's tests:

Bentley (1963) validated his new battery of tests by comparing the results with four criteria:-

1. " Class teachers estimates;
2. Progress made in instrumental practice;
3. Performance in the tests of highly selected musicians; and
4. Other established examination techniques" (P.140)

Using criterion No. (1) he tested 314 boys and girls who were assessed by their teachers, according to their musical ability, on a four point scale: A = musical; B = fairly musical; C = not very musical; and D = unmusical. The Chi-squared method indicated that there is an agreement between the two assessments (the teacher's and scores on the tests). "The children who were assessed as "musical" or "fairly musical" scored higher marks at the tests, just as those who scored the lower marks had been classified unmusical". (1966 P.81).

Under criterion (2) 116 children who were enrolled to play the violin and the violin cello, in several schools, were rated by their teachers on a four point scale: A = good progress; B = fair progress; C = Slow progress and D = Little or no progress. Bentley stated that there was an association between the abilities measured by the tests and progress in string-playing which was significant at the .02 level.

For a third check of the validity of his tests, Bentley gave them to a group of 120 graduates in music, 22 professional string teachers and 18 choral scholars. The scores of the graduates ranged between 60-47, those of the teachers between 58-43, and the choral group between 57-38. 3% of the first group obtained full marks and only one scored below 50. Bentley indicated that both children and adults scored well in this battery of tests and this suggests that "there is strong, positive association between what the tests measure and the functioning of acknowledged musical mihds." (1966 P.84).

For further evidence of validity, Bentley correlated the total scores on his tests obtained by 70 boys in their first year of Grammar school with scores on musical tests given to them in school. He found a correlation coefficient of .94. He states that "this indicates an extremely close correspondence between the two sets of figures", and concluded that "from the above evidence it would appear that the tests, as ——measurements of some aspects of musical ability, are valid," (P.141,1963).

In the present investigation, the Bentley test battery was given to two groups of children numbering 111 and 74. The first group was not as highly selected as the second. The tests were correlated with the teachers' marks on musical subjects in their different schools (Table 18).

Table 18

Subjects	Criteria	Pitch	T. Memory	Chord Anal.	R.M.	Total
1. 111 subjects in General Preparatory Schools.	1. Performing	.23	.26	.08	.13	.24
	2. Music Theory	.14	.15	-.02	-.02	.03
	3. Sight-Singing	.19	.18	-.03	.12	.13
2. 74 Children in the National Conservatory of Music	1. Performing	.51	.36	.23	.21	.46
	2. Music Theory	.27	.19	-.07	-.07	.18
	3. Sight Singing	.27	-.06	.03	-.10	.12

For both groups, the Pitch test and the tonal Memory gave higher figures than did tests 3 and 4; and the Pitch test is clearly more valid in the selected group. A summed correlation coefficient of .169 was obtained between total score and the total teachers' estimates in the first group and .374 in the second group. Although these figures are not as high as that given by Bentley's .94, the battery seems to differentiate well within the highly selected and the unselected group of musically talented children, as indicated by the mean scores obtained by the two groups.

Lundin's Tests of Musical Behaviour:-

The battery constructed by Lundin includes 5 tests which as he states (1949) "measure directly and in an objective fashion some of the kinds of musical behaviour not heretofore considered by previous investigators, and which (we) believe are important constituents of musical personality". (p.3.)

The five tests are as follows:-

1. <u>Interval discrimination:</u> the test consists of 50 pairs of intervals half of which are played as ascending and the other half as descending intervals. The subject has to state whether or not the second interval is the same or different from the first. In its earlier form the test consisted only of 25 pairs of intervals in which no differentiation between upward, or ascending, and downward or descending intervals was made.

2. <u>Melodic transposition:</u> 30 pairs of melodies, the second melody is always played in a different key from the first. The subject has to state whether the two are similar (except for the change of key), or different.

3. <u>Mode discrimination:</u> 30 pairs of single chords either same or different in their harmonic structure, e.g. major and minor chords, and the subject has to identify whether the two chords are or are not similar.

4. <u>Melodic Sequence:</u> The test consists of 30 sequential groups or patterns. Each item has four such groups. In all cases, the first three patterns follow the same melodic order, but sometimes the last group does not follow the same pattern as the first three. In such cases the subject has to respond with D, but if all the four patterns are all identical, the subject responds with S or same. All the sequences are diatonic and begin and end in the Key of C.

5. <u>Rhythmic Sequence:</u> The same idea as test 4 but rhythmic sequences instead of Melodic sequences. Lundin used a Hammond electric organ to produce tests 1 to 4, while test 5 is presented on the piano.

The Reliability of Lundin Tests:-

Using the split-half method, Lundin reported the following coefficients for his tests: Interval discrimination .79, .71; Melodic transposition, .65, .71; Mode discrimination, .65, .10; Melodic sequence, .70, .77; Rhythmic sequence .60, .72; total scores .89, .85. These figures are obtained from testing selected and unselected groups respectively.

Lundin argued that the reliabilities of his tests are better than those of Seashore and K-D. He recommended that Test 3 of his battery (Mode discrimination) be used for people with previous musical training, since the low figure of .10 was obtained when testing an unselected group.

Validity of Lundin's Tests:

Lundin validated his tests against teachers' marks on various musical criteria for the musical group only. He reported the following figures for the total score from his battery.

With: Melodic Dictation .70; Harmonic dictation .70; Written harmonization .43; General ability in theory .65; performance .51 and with the total of the criteria .69.

Note that Lundin had used the same criteria to validate Drake's Memory test and his figures are rather higher than those obtained from Drake's.

He stated also that he found a very significant statistical difference between the mean scores of music students and unselected groups on each test and also on the total scores. He concluded that "the tests are measuring behaviour more typical of a group of musicians than of a population of unselelected people". (1967 P.258).

2. Unstanderdized Tests of Musical Ability:-

One of the early test batteries was that devised by Revesz (1920) for studying a musical prodigy. His battery could only be used with individual subjects who are quite highly talented. It includes 8 tests:-

1. To write down a given rhythm.
2. To name a note after being sounded; Revesz considered this ability, absolute pitch, of great importance though it seems too rare and not of great importance for an individual's success in musical education.
3. To recognize an octave if struck successively on the piano.
4. Relative pitch: this is tested by the vocal reproduction of an interval sounded on the piano.

5 and 6. Harmonic sense: tested by vocal reproduction of the constituent notes of chords.

7 and 8. Melodic memory: tested by the ability to sing a melody given, and to play by ear a known note.

Using this battery of tests, Revesz tested 63 boys with age range between 7 to 12. From the results obtained he concluded that the ability to sing back a melody is the most diagnostic of musical ability, while clapping a rhythm is not highly diagnostic. He also found that "instrumental reproduction of melody, absolute pitch, vocal transposition of an interval, and ability to analyze chords, are indicative of musical ability in descending order", (Revesz 1920, In Mursell & Glenn 1938 P. 341).

Schoen's battery includes the following tests. He states that:- "the person's ranking in these tests is supposed to indicate his aesthetic response to the structural material of music". (1940 P.175).

1. Relative Pitch: the test measure one's power to judge the difference between two successive pitch intervals. In this test 60 pairs of intervals are grouped in six series of 10 pairs each. The subject is to judge whether the second interval is larger or smaller than the first. Schoen stated that this capacity is a fairly certain criterion of musicalness. More (1932) reported that when this test was correlated with average music marks, the resulting r = .547.

2. Tonal Sequence The test consists of four two phrase melodies. For the second phrase of each melody there are three alternatives possible endings, in addition to the original one. The three alternatives are inferior to the original. The subject is asked to evaluate the relative appropriateness of the four endings.

3. The Rhythm test: 25 pairs of rhythmic phrases. Each rhythmic phrase consists of two patterns. The subject is asked to judge whether the second phrase is similar to or different from the first and if different to state whether the change occurred in the first or the second pattern of the phrase.

Lowery has devised three tests, namely (1) perference for cadences, (2) phrasing, and (3) memory. He argued that the intelligibility of music depends, to a large extent, on cadences. The test consists of 50 comparisons of different cadences, i.e. perfect, imperfect and plagal. The subject has to judge whether the second cadence of each pair is more complete,

In the phrasing test, pairs of melodies are played, and the subject has to judge whether they are the same or different in phrasing. Wing criticized this test as being only "an examination of memory". (Wing 1936 P.13).

The musical memory test consists of 10 sentences, each followed by variations involving augmentation, diminuation, ornamentation or transposition. In this test, the subjects are required to identify when the theme is being played.

Lowery did not correlate these tests with any external criteria, but the memory test gave a correlation coefficient of .44 with general intelligence.

Serejski and Maltzew(1928) (1) devised eight tests as follows:-

1. Rhythm test: four sub tests are included (a) non-melodic rhythmic tests; in test (1) the subject has to reproduce a rhythmic pattern by tapping it, (2) the subject has to judge whether two rhythmic patterns are the same or different (b) melodic rhythms: tests (3) and (4) are the same as (1) and (2) but given melodically.

2. Absolute pitch: a tone is given on the piano, then after an interval of distraction, the given tone is to be selected out of series of tones.

3. Relative pitch: 4 sub-tests are included (a) recognition of successive intervals; the subject has to identify one given interval when reproduced in a series of five intervals (b) recognition of

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(1) In Schoen (1940) PP. 169-171.

simultaneous intervals of two tones; (c) recognition of three clangs; (d) reproduction of successive intervals; an interval is given which is to be reproduced vocally then a different initial tone is given and the interval is to be built onto the new tone.

4. <u>Chord analysis</u>: 2 tests: (a) giving the number of notes in a chord; and (b) naming tones in a chord or reproducing them vocally.

5. <u>Tonal sequences:</u> This is a test of sensitivity for tones in a defined tonal environment. The subject is given a tonality, after which he hears a pair of tones and is asked to designate which tone is stable and which unstable in relation to the established tonality.

6. <u>Melodic tests</u>: (a) singing a familiar melody, (b) reproducing a melody which has been played on the piano; in this test two melodies without accompaniment and two with accompaniment are used; (c) in the third test, the subject hears a melody, then a version modified either in tonality or modality, followed by the original. The subject is to state which of the two is the original melody.

7. <u>Final tests</u>: (a) identification of a melody played with true or false accompaniments, (b) a melody played with several accompaniments, the subject has to state which accompaniment is most satisfactory, and (c) subjects have to complete a melody, or invent a melody for a given text, or invent melodies without text.

No information about the reliability or validity of the tests is available, but it seems that this battery is very comprehensive and useful, at least for individual testing.

Ortman's Battery of tests:(1)

Seven tests are included in this battery which were used in the Peabody Conservatory of Music.

1. Pitch discrimination: 50 pairs of tones arranged in 5 series. The pitch differences in the series are respectively 8, 5, 3, 2 and 1 cycles. The stimulus is a standard tone of 435 cycles. The subject judges whether the second tone is higher or lower than the first.

2. Pitch Memory: 5 series of tones, each beginning with a standard tone to be remembered and a number of other tones to be judged as higher, lower, or the same as the standard. (Very similar to Bentley's (1963) Pitch test).

3. Time Discrimination: 50 pairs of five-click patterns. One member of each pair is a pattern of even clicks. The subject judges whether the second pattern of each pair is more even or more uneven than the first.

4. Fusion test: 5 tonal combinations of varying degrees of fusion are given. The combinations are two, three and four tones. Each combination is given 10 times and the subject is to judge the number of tones in each combination.

5. Rhythmic Memory: 5 series of five-click patterns. Each series consists of a standard and five modified patterns. The subject is to remember the standard pattern and to judge the other patterns as "more even" or "uneven" or "same" as the standard.

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(1) In Schoen 1940 PP. 180-181.

6. Melodic Memory: 25 pairs of 2-6 tone melodies. The subject is to state whether the second member of each pair is the same or different from the first.

7. Harmonic Memory: 5 series of chords each begining with a standard chord. The subject is to judge if each is the same as or different from the standard chord.

No information is available in reliability or validity of this battery.

In (1931) Mainwaring attempted to analyse the cognitive processes involved in musical ability and their nature, and devised a large battery of tests which could be classified into three types:

1. Pitch differences: Six sub-tests were included in which tests 1 to 3 investigated "the mere education of differences in pitch" and tests 4 to 6 "the ability to educe relative differences".

In the first three the subject has ~~to~~ (1) to state whether two sounds are the same or different; (2) to state which two of 3 notes are the same in pitch; and (3) a series of four notes, where the subject is to identify which two are alike.

In test 4, the subject is to state if two, three or four notes when played successively move up or down.

In tests 5-6, the subject is asked to judge the relative width of intervals played together or separately. The pitch tests showed a fairly good co-relation with general intelligence namely .53.

2. Eduction of Rhythmic Patterns;

(a) 20 items are included and are produced on a buzzer. The student is asked to state if they are in duple, or triple time; (b) a 6 item test in which the subject is asked to fit a given rhythm to a verse of poetry. Mainwaring indicated that this test does not indicate musicianship. The intercorrelation of these tests with "g" was .46.

3. Auditory Recall tests: (Memory)

(a) a tune is played, then followed by a set of questions such as: how many notes are there? how many notes were similar at the beginning of the tune; are the last notes similar or different?; or state the time signature.

(b) The same questions were asked but this time the tunes have to be recalled. Tunes used in this test are well-known to the children tested.

Only a very low correlation was found between these tests and "g", namely .04.

Mainwaring reported the following reliability coefficients for his tests, Pitch .88, Rhythm .77 and Recall .73, but he did not validate them against any external criteria. The correlations between the tests were found to be very low. From his study, he concluded that "Musical ability ..... includes a complex group of cognitive processes which show but little .... significant positive correlation".

More (1932) constructed a battery of five tests which were to be used with other tests for the prediction of success of college freshman specializing in music. Two of these tests were concerned with Recognition of Pitch errors and Time errors in the notation of familiar melodies. These two tests are similar to the Kwalwasser-Ruch tests of Musical Accomplishment. Tests 3 and 4 deal with Aural and Visual Discrimination of Pitch and Time errors.(1) The idea that prompted the formation of these tests was that the detection of errors in unfamiliar music would require " a considerable degree of coordination betwen the visual image and aural acuity in pitch discrimination and time discrimination".(P.205) In the fifth test, Discrimination of voice movement, two chords of 3 notes each are played successively. One note is changed in the second chord by moving either up or down a semitone. The subject has to state the direction. Note that this test is very similar to Wing's Pitch change test.

These and other tests were given to 179 students whose scores furnished the data for validation. More reported the following figures for his tests when correlated with average music marks: Pitch errors .483; time errors .449; Pitch discrimination aural and visual .559; Time discrimination aural and visual .563; and Voice Movement .534.

Madison's (1942) work was concerned with interval discrimination as an index of musical ability. He believes that

(1) The Melody and Rhythmic Identification devised by the writer is, to some extent similar to those two tests. See Chapters IV and V below.

such discrimination is a form of achievement due to development through past experience, environment and training. Since interval discrimination is basic to all musical perception either in melodic or harmonic relationship, this ability seems to be essential for music education.

Scores on Madison's interval discrimination measures have been found to correlate from .46 to .72 with grades in theory at the Juilliard School of Music and from .39 to .71 at the secondary school level with musical achievement.

Whistler-Thorpe Musical Aptitude Test

These tests use musical material as stimuli, rather than pure tones. The battery includes: (1) Rhythm recognition (two forms) in which the subject has to identify whether two patterns are the same or different; (2) Melody Recognition, follows the same principles as test 1 but with melodic phrases; (3) Pitch discrimination test: in which pairs of chords are played, the subjects having to state whether similar or different; (4) Pitch Recognition: here a particular pitch is emphasized and the subject has to count the times it appears in a melody of four measures.

"The Whistler-Thorpe has a reported reliability of .93. It claims to correlate at .78 with teacher's estimates of vocal talent" (Farnsworth 1958 P.244).

Franklin's TMT* Test

On the assumption that melody normally ends on the tonic and that musically talented individuals tend to perceive musical gestalts, Franklin devised his TMT test. The test consists of 25 unfinished melodies, which are presented to the testees on the piano. The subject is asked to finish these melodies either by singing or whistling the final notes, and these are scored for the correct recognition of the tonic. The test takes 15 minutes to test each individual.

The reliability of this test, both by retest and split-half methods rises to the .80's or .91 when corrected by the Spearman-Brown formula. Franklin stated that this figure is very satisfactory for a music test with only 25 items.

The validity of Franklin's test was .51 when correlated with teacher's estimates of the musical talent of 32 subjects. Franklin stated that "with regard to the validity of the TMT test, it is excelled only by Wing's test battery taken as a whole. Possibly the validity of the TMT test may prove to be higher in testings with other groups, especially, as is likely with an average sample of the population. In the fundamental TMT research ... the reliability and validity obtained must be considered good". (P.150).

3. Tests of Musical Feeling and Appreciation:

Under this heading we will be discussing these batteries

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* TMT = Tonal Musical Talent

of tests devised as a means to evaluate musical ability from an aesthetic point of view. This does not mean that all the tests so far described were concerned only with perceptual aspects of music, since the K-D's battery, Wing's-Battery, Drake, Schoen and Sergiski and Maltzewall included certain tests involving aesthetic judgments. (See table 4 above).

In testing aesthetic judgment, one of two methods is always adopted; (1) usually the item includes 2 versions of the work, one the original and the other a distorted version; (2) two original works are included, but one is poorer than the other in aesthetic value.

Trabue (1923) used method (2) in his investigation. He asked his subjects to grade 18 gramaphone records according to their preferences. The test has been critized as very long, but one advantage is that it is recorded so that performances are consistent. Vernon (1930) used a similar method, asking his subjects to record their reactions to 30 programs and compared these with judgments by experts. Vernon reported a reliability of .845 using the split half method, and the taste marks correlated to .76 with ratings of the musical level of the subjects.

Farnsworth (1949) reported that he found high agreement between secondary school children and Musicologists who were asked to name, from a list given, four composers who contributed to music most. He considered this agreement as evidence in measuring the subjects' musical taste.

Both Adler (1929) and Hevner (1931) followed method (1) in testing judgment in musical aesthetics.

Adler's (1929) test included criginals and three mutilated versions. The alteration in the mutilated versions consisted of either (a) change of harmony, (b) over elaboration, or (c)altered phrasing. Note that Wing used the same aspects in his tests, but excluded the over-elaboration method. Hevner also used this method but found that the choice between four alternatives is rather difficult and therefore included only two alternatives. She found that the four-and two- alternatives were very similar in their reliability when calculated by the Odd-even method and the Spearman-Brown formula. Both forms were given to similar groups and the reported reliability was found to be .70 to 72 for the four-version test and .70 for the two version test.

In validating her test, she correlated the results of the test scores and musical training for 123 high school pupils and 74 psychology students, and reported coefficients of .55 for the 4-alternative test and .45 for the 2-alternative test.

The two version test was elaborated and is well known as the Oregon Music Discrimination Test. A full description of this test is included in Cahpter V below.

Long (1965) revised the Oregon Music Discrimination test, by including rhythmic, melodic and harmonic alteration as well as "same" items. Modern music was also introduced as a material for some of the items. Long suggests that "the new test has more discriminative power than the original Oregon test, but that music students have a decided advantage". However, Lundin (1967) concluded that this is not a criticism of the new revision "since musical feeling and appreciation are developed abilities", (Lundin 1967, P.254).

The test has been recorded on magnetic tape, but is not yet commercially available.

Vidor's (1931) melodic taste test is very similar to that of Schoen, K-D, and Drake. The subject has to choose the better responsive phrase following an intial one.

Kwalwasser's test of Musical Information and Appreciation

Kwalwasser's (1927) battery includes five tests which ask for information mainly on the history of music, acquaintences with which does not depend on any specifically musical abilties. The performance of such a test does not imply an interest of music since the knowledge of instruments, orchestration or of the structure and form of music, could be acquired from text books by students who do not necessarily possess high musical ability or experience. However, in the present investigation a musical knowledge test similar, to some extent to Kwalwasser's test was included in the adults battery. It was found that with only the more selected group, this test gave some significant inter-correlations with musical ability tests especially with Oregon's and Seashore's test batteries.(1)

Semeonoff (1940-1941) asked his subjects to select the correct interpretation of a piece of music from a group of four alternative titles. He found that "the ability to interpret

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(1) See Chapter VII below.

music was fairly constant for the individual and relatively independant of musical training and experience", (1940, P.340). But the test author indicated certain deficiences in the material, and the statistical treatment of the results obtained.

Keston and Pinto, (1955) investigated the relation between musical appreciation and a number of psychological traits of their subjects: (a) introversion-extroversion; (b) masculinity femininity; (c) age; (d) educational level; (e) sex; (f) formal musical training; (g) ability to recognize musical composition; and (h) intelligence. The Keston Music Preference test was used which asks the subject to rank his preference for each of four musical excerpts in each of 30 items. In the Keston Music Recognition test the subjects indicate which of 34 composers wrote each of 30 classical excerpts. The Heston Personal Adjustment test, and a questionnaire were also given to 202 college students. The authors conclude that "the most important factors influencing musical preference are intellectual introversion, music recognition, and musical training, while intelligence, sex, age, and masculinity-femininity were found to be negligible factors", (P.112).

Fay and Middleton (1941) found that preference for classical music is related to the cultural (economic, social, and educational) background of the listeners. They stated that this "conclusion is consistent with the frequently expressed opinion of musicians and music critics that the liking of good music is a result of training in appreciation of and frequent listening to good music". (P.573).

To sum up, we have discussed most of the important tests of musical abilities, based on different points of view. A number of other batteries mainly concerned with musical achievement were excluded.

While one's choice of tests must naturally be based on the purpose for which they are required, in the writer's opinion, when the selection of students is the main object, both perceptive and appreciative types of tests should be covered, making use of the good variety of existing tests.

CHAPTER III

The Nature of Musical Ability

In the previous chapter, the discussion included the different theories put forward by various psychologists which followed different points of views and the several test batteries which they have constructed to test their hypothesis and theories. In this chapter we will discuss the investigations carried out to explore the nature of musical ability, using the different tests with different populations. These studies could be classified under the following headings according to which our discussion will follow:-

1. Id Musical Ability inherited or acquired?
2. The Trainability of Musical Ability.
3. Sex differences in Musical Ability.
4. Musical Ability and Race differences.
5. The relation of Musical ability to general intelligence.
6. The relation of Musical ability to other abilities.
7. The determination of the nature of musical ability through the intercorrelation of tests.

and 8. The determination of the nature of musical ability through factorial methods.

1. Is musical ability inherited or acquired?

As with any other ability, different views will be held on the question of innateness. However, many who say that it is inherited admit the importance of environment for the development of what has been inherited. Others who ignore the existence of innate components of musical ability still admit different degrees of biological aspects. To cite Farnsworth (1958): "It is now true that neither nature nor nurture can alone make a musician. Both must be present before musical and other abilities can emerge," (P.184). Most psychologists might agree with this opinion, but ideas differ as to which side is more important.

Psychologists such as Seashore and Schoen appear to think that talent is entirely a result of natural endowment, and that it may be inherited in various degrees. To cite Seashore: "musical talent" he believes, "is an inherited trait ... it lends itself better than any other talent to the investigation of the laws of mental inheritance because it does not represent merely a general heightening of the mental powers, but is specifically recognized as a gift which can be analyzed into its constituent elements, many of which can be isolated and measured with reasonable precision," (1938 P.330).

It is apparent that Seashore's view is related to what his battery of tests aims to measure, since he has also commented on the possibility that musical ability is acquired. He stated that "So long as we rate the presence of musical talent, we shall be dealing mainly with the superficial, sociological, and pedagogical phenomena of opportunities and scope of musical training or with the effect of inhibiting circumstance on spontaneous self-expression in music," (Seashore 1947, in Lundin 1967 P.217).

In Schoen's view "musical talent is first an inborn capacity. artistic musical performance rests ultimately on innate, inborn equipment. It is not something that is acquired in one's life time, but the person is born with or without it. All that one can do is develop that which already exists potentially", (1940, P.161). Kwalwasser (1936) and Drake (1957) also emphasize the hereditary side.

Hurst (1912), Wallace (1914), and Copp (1916)believe that musical ability is innate and hereditary, but that individuals could loose this inborn talent through lack of training. Lowery (1952) also emphasizes the importance of training. He stated that "suitable training is the most important factor in musical education, even with modest innate ability, it transcends all other factors", (P.130)

Other psychologists, such as Wing and Drake, agree that musical talent is likely to be basically innate, but this innate potentiality may be greatly influenced by the environment. This view appears to be on the same lines as stated by Burt (1924).

Shuter (1964) states that "like language, music is obviously an acquired ability. Nevertheless, as with language there may be innate aptitudes which are inherited and which may fundamentally influence the speed and level of learning", (P.8)

On the other hand, some psychologist with extreme environmentalist views has set out "to qualify the somewhat dogmatic statements of Seashore and Schoen on the hereditarian side. (Ibid P.189). Lundin states "that musical talent is the result of previously acquired skills and not inherited genius should be clear by now. No great composer or performer ever achieved this goal without long hours of apprenticeship and struggle." (1953, P.190). However, it seems that Lundin does not reject altogether the idea of inherited influences (see P. 123 below).

Investigations which have been carried out on this problem can be classified into 3 categories. However, since a very extensive survey of the literature has been produced by Shuter (1964) the present writer would prefer to give only a quick review of some of the studies. The three categories are as follows:-

1. Genetic studies;
2. Studies carried out by questionnaire;
3. Families of Musicians.

1. Genetic Studies

These studies were concerned with the musical traits of parents and offsprings, or of sibling including twins.

Smith (1914) gave a pitch discrimination test to two large groups of siblings. One group gave a correlation of .48 and the other of .43. In each group a younger sibling was paired with an older sibling. When the younger children from both groups were paired with other unrelated children of the same sex and age, a correlation coefficient of .53 was obtained. Farnsworth (1928) commented that Smith's work "may be construed ..... as favouring the environmentalists". (p. 235)

Stanton tested 85 parents and offsprings with Seashore's pitch, intensity, time and tonal memory tests. She stated that "these measures were supplemented by a systematic interrogation which covered questions in regard to musical environment, musical education and training, musical ability, musical appreciation, musical memory and imagination," (1922, p. 202). Shuter summerized Stanton's results as follows: (included in table (19) .

Table (19)

	No. of Matings	Children at Maturity			
		Musical		Unmusical	
		N.	% age	N.	% age
1. Both parents are musical and from musical stock.	5	10	91	1	9
2. One parent is musical and from musical stock, the other unmusical and from unmusical stock.	10	6	37.5	10	62.5
3. Both parents unmusical and from unmusical stock.	6	-	-	25	100

Stanton concluded that "parents who are musical and whose ancestry is musical on one or both sides tend to have musical children; those parents, one of whom is musical with musical ancestry, the other non-musical of non-musical ancestry have children of both types." (P.184).

Friend (1939) also used three of Seashore tests namely, Pitch, intensity and consonance in testing 20 boys and 22 girls and their parents. His results are included in table (20)

Table (20)

	Pitch	Intensity	Consonance
r = Parent's - child's scores	.14	.46	-.11
r = Mother's - child's scores	.09	.28	-.08
r = Father's - child's scores	.02	.16	-.04

He concluded that there is rather a closer relation of mother and child than father and child.

Swift (1939), Mizer (1941) and Williams (1952) used the K-D test battery in studying siblings. Swift obtained a correlation coefficient of .48 between the scores obtained by 255 pairs of sibling.

He also found the correlation coefficient for 71 pairs of brothers to be rather higher than that obtained from 65 pairs of sisters. Mizer obtained a relatively higher coefficient in correlating the scores of 25 twins, namely .77. While Williams obtained an intermediate coefficient, .53 with 151 negro siblings.

Kwalwasser (1955) mentioned three attempts made by Oakley (1946), Scriber, (1946) and Sonthien (1946) to compare the scores of parents and children on the same battery. In these studies the correlation coefficients were rather lower than those obtained by Swift, Mizer and Williams (in the sibling studies) Kwalwasser concluded that his low correlation may indicate the unfavourable attitude of the parents towards music.

In a study of 6 families with a large number of musically talented members, Giordano and Guli (1960) reported that the data "support the position that the genetic transmission of musical aptitude is due to "a monomeric autosomic dominating character". (Psychol.Abst. 1961).

Vandenberg (1962) gave mostly sensory ability tests to identical and like sexed fraternal twins. He concluded that twins tend to influence each other's preference and that even identical twins brought apart do develop similar tastes.

Shuter (1964) tested 20 pairs of MZ child twins, 21 pairs of D.Z. twins of like sex and 9 pairs of unlike sex. The tests used were Wing's battery. The intercorrelations of the MZ ranged from .794 to.846 and for the DZ from .677 to .761; in other words the monozygotic did not show much higher resemblance on total score than the dizygotic. She also compared the scores obtained from 25 cases where both parents could be tested. She found that, the father child correlation of .627 was much higher than the mother child correlation.

From the questionnaire information in the present study, there is also some indication of a closer association in musical ability between father and child than mother and child. (See Chapter IV and V below).

In this study, 12 sets of siblings were also included in the selected children's group (N.C.) Table (21) below gives the classification of these siblings as being in the top 10% (Grade A) 20% (Grade B), Middle 40% (Grade C), 20% (Grade D) and bottom 10% (Grade E). The classifications are based on Seashore percentile equivalents and Bentley's test norms.

Table (21)

Sets of Siblings	Sex	Seashore Tests: Pitch	Rhythm	Time	T. Memory	Bentley Total
5 Sets of one Brother and one Sister.	B	B	A	B	C	A
	G	C	A	C	B	A
	B	E	A	E	A	C
	G	A	D	D	E	D
	B	D	D	C	B	C
	G	E	E	D	E	D
	B	C	A	D	E	A
	G	A	A	E	A	C
	B	C	C	B	B	E
	G	C	A	C	A	E
3 Sets of Two Sisters	G	E	E	E	E	C
	G	C	A	C	A	D
	G	E	B	D	D	D
	G	E	C	E	B	C
	G	D	D	C	D	C
	G	E	D	A	D	C
1 Set of Two Brothers	B	B	B	D	C	D
	B	E	C	C	E	E
1 Set of One Brother and Two Sisters	B	A	A	D	B	B
	G	C	A	B	B	E
	G	E	A	E	C	D
1 Set of Three Sisters	G	B	A	C	A	C
	G	A	A	A	A	A
	G	B	A	C	A	E
1 Set of One Brother and Three Sisters.	B	D	C	B	E	B
	G	E	C	C	E	A
	G	C	A	B	E	C
	G	E	E	C	E	C

The numbers of family groups showing identical grades on the various tests are as follows:-

Pitch	Rhythm	Time	T.Mem.	Bentley Total
2	5	0	3	3

Though the numbers are small this would suggest that Rhythm and Tonal Memory show most similarity among siblings, Time least similarity; On the other hand there are a few pairs showing extreme discrepancy,

i.e. A vs E grades, as follows:-

Pitch	Rhythm	Time	Tonal Memory	Bentley
2	2	0	3	0

respectively. The fact that those exist among brothers and sisters brought up in much the same environment suggests the operation of genetic differences.

2 - Questionnaire Studies

One of the early investigations was carried out by Heymans and Wiersma (In Revesz 1953), who sent a questionnaire to 423 "educated" persons, through which they obtained information in the mental and emotional characteristics of both parents and children. Among the questions was one concerned with the musical ear which the researchers considered as an important index of musicality. The following table (1) indicates that musical ability (as assessed by the informants), is inherited,

(1) After Revesz (1953) P. 189

though presumably musical parents would also be more likely to provide a musically stimulating environment for their children.

Table (22)

Inheritance of a Musical Ear

	Percentage of Children		
	Musical Ear		Indefinite
	Good	Poor	
Both parents with good musical ear.	84.0	10.4	5.6
One parent with musical ear; the other with poor musical ear.	59.4	35.9	4.7
Both parents without musical ear	29.7	62.5	7.8

From this table one can conclude that the likelihood of musically talented offspring is much greater with musically talented parents than with unmusical parents, while when one of the parents is musical, Revesz concludes "the positive qualities dominate as a rule over the negative to a great degree".(P.190).

Haecker and Ziehen (1922) used 11,000 questionnaires to obtain data on the inheritence and development of musical ability. The questions included four factors or components to be stated by subjects, namely: (a) sensory: including sensitivy to pitch, intensity and duration; (b) retentivity: including memory for timbre, pitch, intensity, duration, tonal successions and tonal combinations; (c) Composition: the feeling for the formal elements of music, melody, motif, theme...; and (d) motor factor: as indicated by the power to produce heard stimuli vocally and instrumentally.

The results obtained from these questionnaires also indicate a close parent-child resemblance. They are summarized by Revesz and are shown in table (2) (23)

Table (23)

Inherited Musicality

	Percentage of the Children		
	Extremely Musical	Moderately Musical	Unmusical
Both Parents extremely musical.	85.6	6.5	7.9
One parent musical, the other unmusical.	58.6	15.0	26.4
Both Parents unmusical.	25.4	15.9	58.7

The results of this research are consistent with those of Heymans and Wiersma. Furthermore they indicated that "the musical disposition is inherited to a greater degree from the father than the mother."

(2) After Revesz (1953) P.191.

On the other hand, Drexler (1938) who compared the capacity of 23 pre-school children to learn to sing melodies with that of their parents, found that the child-mother r = .62 while with father it is .37. He indicated that this situation is more likely since the child imitates the mother's voice rather than the father's (possibly because it is rather difficult for a child to imitate a man's voice).

Mjoen's (1926), study gives further evidence that musical ability is inherited. In another study (1934) he has drawn the following conclusions:

"Untalented parents never have very talented children, while very talented parents never have untalented children. The higher the average of talent in the parents, the higher is also the average of talent in the children. When there is only a slight divergence or none at all in the parents, the average talent in the children is a little higher than that of the parents. When the divergence increases the average talent in the children declines; so that in cases of great divergence in the parents the average for the children is lower than that of the parents. Accordingly, it seems that a great difference of talent in the parents exercises an unfavourable influence on the degree of talent in the children". (In Seashore 1938 P.345).

Wing (1948) came to the same conclusions as Mjoen from a study of 333 sets of answers to questions on musical ability and the effects of environmental influences. Those selected were within the age range 14-18. He classified them into 3 grades namely AB (above average), C (average) and DE (below average) according to their performance on his tests. Wing found that for the DE group the relative proportions of the non-playing parents (as indicated from the subjects questionnaires) to playing parents was approximately 10:1 while for the AB group the proportion was 4:1. If both parents played, the child's chance of having higher than average ability was much greater than if one parent or none played. These findings led Wing to the conclusion that musical capacity is inherited. Again in 1963 Wing indicated that nature is far more important than nurture.

3. The Study of Musical Families

Revesz (1953) collected evidence about musicians whose parents were talented. Out of 40 names listed (P.192) he indicated that 36 Fathers were talented while in only 4 cases were the mothers talented. Scheinfeld (1956) reported, from his study of 123 student performers at the Juilliard Graduate School of music, that when both parents are musical 70% of their offspring have musical talent; where one of the parents is talented the proportion is 60%; and when neither of the parents is talented only 15% of the offspring show talent.

Families of six composers were studied by Giordano and Guli (1960), namely Bach, Beethoven, Mozart, Puccini, Sabata and Savagnone Abbado. Of these the Bach's family was the most notable.

In 6 generations there was 29 professional musicians, 16 composers. Other members of the family were also reported to have musical talent though not known as professionals.

Although the data obtained from these studies indicate that musical ability is inherited, Lundin, however, considered that "the studies of family histories can support a view preferring "the acquisition of musical behaviour just as well as they can support the inheritance theory". (1967 P.221). Pronko and Bowles (1951) also support this view, pointing out that in Hayden's family, there was not a single musician for two generations. And concerning the Bach family they indicated that music ran in the family for several generations as the German Language did. They concluded that "It is obvious that whether the Hayden or Bachs'. composed or performed, they were interacting with stimulus objects - pianos, organs, notes, teachers. Furthermore, they were not geniuses, from the very beginning. Their genius behaviour was the culmination of a series of events of their reactional biographies involving long hours of practice and other labor". (P.26).

Lundin, while emphasising environmental factors does not deny that biological factors are also involved. He stated, (1944), that "We should not be led to believe that musical ability is the result merely of classroom achievement" .... (1944). In another study Lundin (1967) commented that "musical accomplishment is not the mere result of inherited inspiration but is also a product of hard work." In other words if there is a deficiency in inherited structures, this will affect the musical, as it does other kinds of behaviour. On the other hand, stimulation in early childhood has strong effects on what is inherited. And even with good inheritance as well as good stimulation, no progress will be made without hard work.

Wing, also, although he stated that musical ability is innate, did not ignore the effects of environment. His results showed that a favourable environment is likely to generate an interest in music in the child. Edmunds (1960) states that both factors should be considered since it is difficult to separate "the effects of the environment from the effects of heredity on potential musical ability" (P.22).

To conclude this section, the writer's view is that musical ability is an innate ability (or group of abilities) without which a suitable environment cannot be effective. But even a child who has got a very high sense of pitch discrimination will not play the violin correctly without appropriate guidance, encouragement and training. On the other hand, the child without pitch discrimination cannot play the violin correctly even if he is perfectly guided and encouraged and has studied for very long periods. He may be a good performer on a fixed pitch instrument, like the piano, but not a stringed one which required a very high sense of pitch.

2 : The Trainability of Musical Ability:

How far can such innate abilities be trained?

There are many studies claiming to prove or disprove the effects of training. The method used is to test a group of students, then follow this by certain methods of practice which, in the investigator's opinion, may affect the second performance. Most of the investigators concerned themselves mainly with the effect of training on sensory capacities, especially pitch discrimination.

One of the early experiments on training pitch distrimination was carried out by Buffum (In Farnsworth 1928). 28 8th grade pupils were tested individually in pitch discrimination and were trained for 20 days under favourable conditions. When retested, the results showed no improvement except for two cases. Smith (1914) reported somewhat similar results. He stated that, with 476 children, "the sensitveness of the ear to pitch differences cannot be imprcved appreciably by practice". On the other hand, Farnsworth (1903) found that "the effect of systematic training of an unmusical person is a curiously complex one - there appears marked improvement under certain conditions, along with none at all under others." Farnsworth was able to train his subject to discriminate pitch differences of less than three vibrations, but in some instances she failed to discriminate differences of more than two octaves.

Seashore stated that "the sensitiveness of the ear to pitch differences cannot be improved by practice". To confirm or disprove this statement, McCarthy (1930) tested his subjects four times and stated that "the results for the pitch test bear out Seashore ---- the discrimination of pitch remains practically constant from first to fourth test". Another study using the Seashore Pitch test was carried out by Capurso (1934). He gave this test to 58 music students and chose the best 6 scorers and the 7 lowest scorers as subjects. Four of the high and 3 of the low scorerswere given special training for a certain period after which the experimental and control groups were retested. The results showed that the experimental group showed an average gain of 8.3 after training, while those control group showed an average loss of .16.

With the Intensity test, Seashore (1919) tested 14 subjects and trained them from 14 to 30 half-hour periods each. He found that the achievement was practically the same at the end of the practice periods as the beginning. In another study he compared 15 blind "from infancy" subjects with 15 sighted students in pitch and intensity discrimination. He found that the average scores were approximately the same and concluded that the training which the blind had had since childhood had not tended on the whole to make them keener in these abilities. In another study Sakurabayashi et al(1956) found no clear differences between the normal and blind subjects in their auditory discrimination as measured by the Seashore tests.

However McCarthy (1930) found that practice affected scores on the intensity test. In McCarthy's study there was an increase from the 66th to the 82nd percentile rank after 4 testings. Larson (1928) reported that her musically trained subjects scored above the untrained on the consonance test.

Ross (1914) found that discrimination of time as measured in the Seashore test (old version) displayed a marked improvement in the case of eight subjects when the test was repeated seven times on successive days.

McCarthy also studied Seashore's statement that "Memory is capable of cultivation on a large scale". He stated that "the results on the memory tests show the improvement expected by Seashore, with an increase in median percentile rank from 55 to 75". He agreed with Seashore (1919) that "such improvement in the use of a given brain capacity is no evidence of improvement in the capacity; it is nothing but evidence of acquired ability to use the available instrument or capacity".

In other investigations the whole Seashore battery was used to determine practice effects. Wright (1928) ascertained that giving the Seashore tests daily for a week increased the average scores slightly but not to any significant extent. Gray and Bingham (1929) compared musically trained subjects, who had had two lessons a week for a year or more with untrained. The trained groups scored slightly higher in all the Seashore tests with the exception of intensity and time where occasionally the untrained made higher scores. This result is very similar to that obtained in the Present investigation where two selected groups (children and adults) scored significantly in all the Seashore tests used (Pitch, Rhythm, tonal memory) but not in the time test, where the less selected group were significantly better.

Stanton and Koerth (1931&1933) tested 157 adults and 645 children before music education started and after 3 years of training. With the adult group little difference was found between the test scores at the beginning and end of the period of musical education. The correlations between the initial and final tests varied from .45 for the time test to .83 for tonal memory. With the children's group, the scores increased more than with the adults but the authors concluded that the "effect of musical training on scores in these tests was negligible". (In Psychol.Abstract 1934). Tamaoka (1937) arrived at the same conclusion from testing 519 middle and high school and a few university students with the Seashore tests.

Other investigations have been carried out using the K-D test battery. Both Chadwick (1933) and Barnard (1932) found a positive relationship between training and K-D scores. Kwalwasser (1936) also found significant difference of 11.25 in favour of his trained subjects, who had had received private music lessons. Gilbert (1940) also reported that trained women in his group obtained higher mean scores than untrained men. This was not considered to be due to a sex difference, since the effect disappeared when only the untrained were compared. Furthermore Gilbert (1941) stated that "Aptitude cannot be considered independent of training and therefore should be taken into account either in the construction of the test by eliminating those parts which are unduly susceptible to training, or in setting up separate norms for trained and untrained individuals". Woods and Martin (1943) tested 578 6th graders with this battery, and likewise found that children who had had previous training averaged higher than those who had not had training.

Wiener (1938), Bienstock (1942) and Drake (1939) obtained different results from those just mentioned. Wiener found a low correlation between scores on the K-D tests before and after one year of intensive training. He stated that there appeared to be no relationship between practice and improvement in test scores". (In Bienstock 1942 (a)). On the other hand Bienstock (1942) observed a slight gain on the K-D scores after one year of training, but this gain was not statistically reliable. In Drake's (1939) study it was reported that "after several years of almost daily musical training, there is no more improvement than that accounted for by maturation as provided for in the age norms." (In Bienstock 1942 (a) P.430).

Drake (1943) studied the effects of ear training on his Musical Talent tests. He gave these to 14 college students and to 58 psychology students. The latter group acted as the control group in this experiment. After the experimental group had attended an ear-training course for a term, he re-tested both groups. He found that the trained group had gained twice as much as the control group, but the gain of 8.29 is not very large in a test having a score range of 90 points. Hence the increased improvement due to training was not significant. In a study of 65 university students Gordon (1961) selected the highest five scorers and the lowest five scorers in the Drake Memory test as his experimental group, and a control group of 5 boys and 5 girls. The experimental group was trained on phrases similar to those included in Drake's test. The results obtained from retesting both groups suggest that as in Drake's research there are no conclusive effects of practice.

Wing (1941) reported that 25 boys aged 15-18 improved their initial score by 4.1% when a second testing was preceded by a 20 minute lesson and discussion on the material of one of the sub-tests, while the control group gained 3.4%. This difference seemed too small to indicate any effect of training on the test scores (P.214).

To conclude this section, the evidence given by several investigators suggests that sensory capacities can be improved under certain conditions, but this improvement in most cases is not great. Sometimes it may be due to greater familiarity with the test material and instructions. The nature of the practice is also important; for example practicing the violin is more likely to improve pitch discrimination than playing the piano.

3. Sex Differences in Musical Abilities

Investigations carried out to determine the influence of sex on performance in various test batteries tend to give different and inconsistent results.

It is generally accepted that there are more male musical geniuses than famales. Although girls are more encouraged to carry on musical studies in many cultures, when boys and girls are compared in most of the studies boys are reported to do better. Valentine (1962) states that "men tend to be more sensitive to musical harmonies than women, a conclusion which seems to be borne out by the rarity of great women composers". This conclusion may be confirmed by general observation, but does not necessarily accord with the results of empirical studies.

Smith (1914) found differences in pitch discrimination in favour of primary-school girls. This was attributed to the boys being aloof since their social training leads them to regard music as girlish, and something to be avoided. About the same time, however, Vance (1914) found that his male subjects excelled females in pitch discrimination. A third view regarding this ability is given by Seashore (1919) who states that there are no appreciable sox differences in pitch discrimination.

In Germany, Heacker and Ziehen (Wing 1948) carried out extensive studies on sex differences and came to the conclusion that males are more musical than females.

Kwalwasser (1927) reported that males tend to get slightly higher score on his tests. However, the median scores of both sexes on the rhythm test were "approximately the same and reveal the sexes to be about equally endowed rhythmically". On the other hand, the same investigator (1935) reported from test of 2,500 boys and an equal number of girls that the mean total scores for girls is superior to that for boys in grade IV in the elementary school and through all grades in high school with the exception of grade V. The girls were significantly superior to boys on pitch, rhythm, tonal movement, melodic taste and pitch imagery, while the boys were significantly superior in quality discrimination. Woods and Martin (1943) also found that girls are superior to boys on the K-D battery. Gilbert (1942) attributed this superiority of girls to the effects of training. Manzer and Morowitz (1935) also reported that the mean scores of the women are significantly superior to those of men.

No statistically reliable differences were reported by Peterson and Lanier (1929) and Farnsworth (1931) on the Seashore tests. Furthermore, Farnsworth (1931) reported that he asked ten quite competent musicians who had previously listened to the Seashore battery, to guess the sex differences, the results were as follows:-

"All but one declared that the girls should, on the average, score higher in pitch, memory, and consonance. The explanatory theories which were involved were similar to the social training idea of Smith ..... The consensus of opinion seemed to be that boys are trained to be more self-reliant, and so would necessarily have more experience in judging time and rhythm. Having more mechanical opportunities, they would be trained to pay close attention to small differences in intensity. One musician decided that girls should score higher in all the tests since girls are naturally more musical. " (P.345)

Farnsworth concluded that "from his own observations that the sex differences found in a schoolroom will vary with the personal qualities and the methods employed by the music teachers .... Under such training conditions as have existed in the past, girls have been slightly more interested in musical tones, and boys in mechanical noises. Certain teachers may be able to alter this state of affairs". (P.346-347).

Other studies in which no appreciable differences occurred between the sexes include those of Tamaoka (1938) who stated that sex is not an important factor in determining musical ability. Wing (1941) indicated that there are some sex differences, especially after the age of 14 when girls tend to show superiority of the appreciation tests, though the two sexes remain the same in the perception tests, hence there is no need for separate sex norms for the tests.

In (1962) Wing indicated that his earlier assumption was justified but suggested that if any appreciable differences are found they would be worth investigating.

Drake (1957) reported that no significant difference had been found on his rhythm test, but that girls tend to do better on his Tonal Memory Test. However the difference is too small to justify separate sex norms.

In their latest revised test manual, Seashore, Lewis and Saetviet (1960) reported that "sex differences were found to be very small and inconsistent from one level to another". Hence combined sex norms are included.

Petzold (1963) designed tests to measure auditory perception of short tonal and tonal-rhythmic configurations. He tested 660 pupils and found no sex differences.

Bentley (1966) compared the scores of 590 boys and 566 girls between the ages of 8-12 on his battery and found that the boys' mean score was 30.1 and that of the girls was 30.9. This difference (0.8) in favour of girls is not significant. This finding was confirmed by the results of 118 boys and 152 girls. Hence Bentley also combined his norms for both sexes.

From the above evidence it seems that the differences may occur under certain circumstances, probably due to influences of the culture or different interests of boys and girls. However in most sensory or musical tests the differences seem to be negligible.

4. Musical Ability and Race Differences:

Studies of race differences in musical abilities tend to be very few in comparison with those carried out on European or American populations. Many of those attempted tended to measure racial differences for samples of the populations living in a certain place, rather than in different home lands. In most of these studies, the differences obtained were small and difficult to interpret. The greatest number of studies dealt with the application of the Seashore or K-D test batteries to negro and white populations.

One of the early studies was carried out by Lewis and Peterson (1924) who gave the Seashore pitch and consonance tests twice to about 300 whites and 270 negroes. On the first application the Negroes surpassed the whites; then the Negroes gained in pitch but not in consonance, while the whites gained in both and excelled the negroes on the Consonance test. However this large gain on the part of the whites may have been due to the selection of the subjects. Lenoire (1925) used the Seashore measures with an equal number (191) of negroes and whites and reported that the negroes were superior in rhythm and tonal memory and about equal on the other tests. Peacock (1928) claimed that whites surpassed negroes on the Seashore tests. While Davenport and Steggerda (1929) reported that no differences on the Seashore tests between these groups namely, pure black, brown and white.

Streep (1931) found the scores of 678 negro children were slightly higher than those of 637 whites on both the Seashore rhythm and consonance tests.

Gray and Bingham (1929) also used these tests with whites and negroes at the 7th and 8th grades. Their results indicated that whites were superior to negroes on all the tests except consonance in which both groups performed equally. The same measures were used to test 409 mixed-blood and 360 full-blood Indian children by Garth and Ishill (1929). They compared these two groups with the white norms and found that "the Indians showed a slightly higher rating in time and rhythm and inferiority in consonance, and a marked deficiency in pitch, intensity and memory". Thomson., (1931) applied the Seashore measures (omitting the consonance test) to 3,300 negroes in colleges and graded schools in Virgina, North Carolina and South Carolina. Comparing with white norms, the results were mostly in favour of whites, though not significant enough to indicate any distinct racial differences. One difficulty noticed in the responses of the negroes was due to confusion over what the terms "higher" or lower" meant in the pitch test. Eells (1933) also reported that if lower scores are obtained from testing a relatively unsophisticated population: e.g. Alaskan Indians, Alents and Eskimo, it is difficult to estimate how much should be allowed for "cognitive difficulties".

Farnsworth (1931) and Ross (1936) have carried out some investigations of the musical abilities of subjects with oriental backgrounds.

Farnsworth tested 36 Japanese and Chinese students at the University of California and Stanford University who were born and reared in America and 53 other students of similar nationalities who had lived in America for a considerably shorter time. These were compared with a third group of 200 white students. Both the Seashore and the K-D melody and harmony tests were used. The white students scored higher in all but the K-D melody test. Farnsworth believes that "the lack of acquaintance with occidental music may cause a lowering of score". The differences, however, were not very large. A very similar result was obtained from the subjects tested in the present investigation, where lower scores were obtained in tests dealing with occidental material.

In Ross's study (1936) the same measures were used with 428 Indian children distributed between the 6th-12th grades. In general, the performance of the Indian children fell significantly below that represented by the white norms. The inferiority of the Indians tended to be least in the rhythm and time tests, and greatest in the case of pitch, tonal memory, intensity and consonance.

Parthasarathy (1950) also tested 192 boys and 83 girls from India with the Seashore tests. He reported that the "Scores for the five measures of pitch, intensity, time, rhythm and tonal memory do not follow the pattern indicated by Seashore which shows the need for local norms.". He stated, also, that Indian boys and girls seem to be superior in their capacity for discriminating loudness.

Using the Seashore pitch, intensity and memory tests and the K-D test battery, Sanderson (1933) tested 100 children from 5 different racial groups namely, Jewish, German, Polish, Italian and Negro. He found that the Jewish group showed marked superiority to all others except the German, who ranked a close second. The Italian group came in the middle position, while the lowest were the negroes who showed definite inferiority in all tests but the rhythm. Witherson (1939) also found that Jewish children make rather higher average scores on the K-D tests than some other national and racial groups.

Sward (1933) carried out his experiment with 200 Jewish and 300 non-Jewish children in the age range 10-11. He used Drake's Memory test, Seashore's Pitch, Intensity and tonal memory, and K-D tonal Movement test. He came to the conclusion that the Jewish and Non-Jewish children are equally endowed with basic musical traits as measured by these tests.

In other investigations in which the K-D tests were used, Robenson and Holmes (1932) reported that Negroes surpassed American whites in all tests except rhythm where only a small difference was obtained. On the other hand, Van Alstyne and Osborne (1937) suggested that "Negro children appeared to be markedly better in motor rhythm, the superiority being greatest for the simplest rhythms and the youngest subjects".

In another study, Woods and Martin (1943) used the K-D test battery to compare Negro and white children in the 6th grade. They found that Negroes were superior to whites and concluded that "cultural determinants are the most significant factors in success on this particular apititude test" and they believe "the type of community from which the children came had a direct bearing on their scores". (In Lundin 1967 P.261).

Wing (1936) reported that only small differences were found between the average scores of English, Welsh, Jewish and German subjects. He used 17 tests from his early battery to determine the differences, if any, between 101 English and 41 German subjects with age range of 12-13. He found that the German children appeared to "do the aesthetic type of test better than the English". He concluded that this is "possibly due to the greater amount of first-rate music that the Berlin Child can hear". (P.94).

Reviewing previous investigations which have been concerned with the existence of racial differences in musical ability, the writer arrives at the following conclusions:-

1. All studies conducted with subjects of different racial origins ignored the use of test material which suit the testees' musical background. Thus if Indian subjects had been presented with melodic tests based on the modal system they

would tend to excel European subjects, since this is the type of music with which they are mostly acquainted.

2. In the case of the Oriental subjects tested by Farnsworth, who had been reared in the U.S.A. for a long period, few differences occurred. This could be expected since they were well acquainited with Western music. Indeed the subjects themselves reported that they hear and play Western music. Their scores were found to be higher than those who reported the performance of oriental music.

3. Many studies have shown that Negroes are superior to Whites on rhythm tests. This fits in with the well known fact that rhythm is an important factor in both Oriental and Negro music.

5- The Relationship of Musical Ability to Intelligence:-

The effect of intelligence on the different test batteries has been studied, but the opinions and results of different authors differ widely.

Seashore in his "Psychology of Musical Talent" reported that none of his tests correlates to any great extent with general intelligence. In (1936) Kwalwasser stated that "General intelligence seems to have little or no significant positive correlations with musical intelligence". In (1939)[1] he also stated that "low

(1) From Edmunds, 1960 P.43.

correlations between intelligence and music tests of sensory capacity are likely to exist". It follows that "low intelligence and superior musicianship are likely to be found together; inferior intelligence is as likely to be found with superior musical ability as is superior intelligence". He added "it is impossible to predict musicianship from musical ability measured by tests, or musical ability from intelligence". Mursell (1937) seems to agree with both Seashore and Kwalwasser since he stated that low correlations are to be expected between general intelligence and musical talent tests such as Seashore's and Kwalwasser-Dykema's. On the other hand, general intelligence correlates highly with teachers estimates; in other words there is a closer relationship between, what he calls, "functional musical ability" and general intelligence.

The actual results of previous studies are included in table (24) below.

An examination of this table shows that most tests tend to correlate positively with general intelligence. Tonal Memory seems to have relatively high coefficients and pitch discrimination gives even higher ones. Spearman (1927) stated that "the abilities to appreciate, for instance, the relations of pitch, loudness, and rhythm have extremely low intercorrelations: no more, in fact, than must be attributed to "g" alone,". (P.340) Spearman's statement is very likely to be true especially since it was based on the earlier version of correlations between intelligence and music tests of sensory capacity are likely to exist". It follows that "low intelligence and superior musicianship are likely to be found together; inferior intelligence is as likely to be found with superior musical ability as is superior intelligence". He added "it is impossible to predict musicianship from musical ability measured by tests, or musical ability from intelligence". Mursell (1937) seems to agree with both Seashore and Kwalwasser since he stated that low correlations are to be expected between general intelligence and musical talent tests such as Seashore's and Kwalwasser-Dykema's. On the other hand, general intelligence correlates highly with teachers estimates; in other words there is a closer relationship between, what he calls, "functional musical ability" and general intelligence.

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Table (24)

Correlations between Intelligence Tests and Musical Ability Tests A: Seashore Tests

Investigators Investigators	Date of Research	Subjects	Intelligence Tests	Sub-Tests P	I	T	C	TM	R	Tot.
Weaver	1924	94 College Students	Army Alpha	.35	.24	.12	.06	.26	.	
Hollingworth	1926	49 Children	I.Q. above 135	46.7 (1)	50.0	58.0		52.[illegible]	.	
Kwalwissar	1927		With Mental Age	.20	.25	.21	.01	.02	.01	
Fracker & Howard	1928	230 College Students	Otis & Army Alpha	.32	.01	.13	.09	.10	.12	
Gray & Bingham	1929	White Boys	(Otis Group							.70
		White Girls	(Advanced							.68
		Coloured Boys	(Examination							.58
		Coloured Girls								.53
Highsmith	1929	(59 Female Music (School Students	Terman Group & Thurstone Psych.Exam.	.58	.35	.39	-.14	.30		
Peterson & Lanier	1929	White Students	Otis test				.04			
		and Negro Students						.45		
Salisbury & Smith	1929	131 Training College Students	Thorndike Exam.	.31	.15	.30	.00	.24	.02	
		144 Training College Students	High Sch.Grades	.39		.49	.38	.33	.24	
Farnsworth	1931	150 University Students	Thorndike Intel.Exam.	.14	.11	.10	-.38	.11	.17	
Fieldhouse	1937	96 Normal Students	Simplex Intel.Test	.40	.32	.30	.07	.14	.28	
		50 Monotones	Simplex Intel.Test	.36	.36	.36	.23	.26	.11	
Drake	1940	163 Boys	Army Beta Type	.12	.14	.08	.03	.07	.05	
Taylor	1941	150 Freshmen Students	Detroit Advanced	-.03	.10	.10	-.27	.06	.19	
Manor	1950	4th Grade Children	California and Element.	.21				.27	.11	
Franklin	1956	79 Training College Students	Anderberg	.13				.00		
		157 Training College Students	Thurston Mira	.15				.14		
Rainbow	1965	91 Students in grades 4-6	Lorge Thorndike Intel.	.19				.22	.28	
		112 Students in grades 7-8	" " "	.23				.26	.22	
		88 Students in grades 9-12	" " "	.43				.26	.33	
Sadek (2)	1968	111 Unselected Children	Cattell IPAT	.23		.21		.31	.24	.35
		74 Selected Children	Scale II	.61		.34		.61	.64	.72
		171 Unselected Adults	Cattell IPAT	.11		.30		.17	.16	.25
		60 Selected Adults	Scale III	.21		.26		.06	.16	.28
		171 Unselected Adults	Saleh Pictorial	-.05		.05		.02	-.09	.0[illegible]
		60 Selected Adults	Intelligence Test	.16		.19		.17	.07	.2[illegible]

(1) A Median Percentile Rank above 100 indicates a correlation with 'g'.

(2) See Chapters VI and VII below.

Table (24)

Correlations between Intelligence Tests and Musical Ability Tests A: Seashore Tests

Investigators Investigators	Date of Research	Subjects	Intelligence Tests	Sub-Tests P	I	T	C	TM	R	Tot.
Weaver	1924	94 College Students	Army Alpha	.35	.24	.12	.06	.26		
Hollingsworth	1926	49 Children	I.Q. above 135	46.7 (1)	50.0	58.0		52.[illegible]		
Kwalwissar	1927		With Mental Age	.20	.25	.21	.01	.02	.01	
Fracker & Howard	1928	230 College Students	Otis & Army Alpha	.32	.01	.13	.09	.10	.12	
Gray & Bingham	1929	White Boys	(Otis Group							.70
		White Girls	(Advanced							.68
		Coloured Boys	(Examination							.58
		Coloured Girls								.53
Highsmith	1929	(59 Female Music (School Students	Terman Group & Thurstone Psych.Exam.	.58	.35	.39	-.14	.30		
Peterson & Lanier	1929	White Students	Otis test				.04			
		and Negro Students						.45		
Salisbury & Smith	1929	131 Training College Students	Thorndike Exam.	.31	.15	.30	.00	.24	.02	
		144 Training College Students	High Sch.Grades	.39		.49	.38	.33	.24	
Farnsworth	1931	150 University Students	Thorndike Intel.Exam.	.14	.11	.10	-.38	.11	.17	
Fieldhouse	1937	96 Normal Students	Simplex Intel.Test	.40	.32	.30	.07	.14	.28	
		50 Monotones	Simplex Intel.Test	.36	.36	.36	.23	.26	.11	
Drake	1940	163 Boys	Army Beta Type	.12	.14	.08	.03	.07	.05	
Taylor	1941	150 Freshmen Students	Detroit Advanced	-.03	.10	.10	-.27	.06	.19	
Manor	1950	4th Grade Children	California and Element	.21				.27	.11	
Franklin	1956	79 Training College Students	Anderberg	.13				.00		
		157 Training College Students	Thurston Mira	.15				.14		
Rainbow	1965	91 Students in grades 4-6	Lorge Thorndike Intel.	.19				.22	.28	
		112 Students in grades 7-8	" " "	.23				.26	.22	
		88 Students in grades 9-12	" " "	.43				.26	.33	
Sadek (2)	1968	111 Unselected Children	Cattell IPAT	.23		.21		.31	.24	.35
		74 Selected Children	Scale II	.61		.34		.61	.64	.72
		171 Unselected Adults	Cattell IPAT	.11		.30		.17	.16	.25
		60 Selected Adults	Scale III	.21		.26		.06	.16	.28
		171 Unselected Adults	Saleh Pictorial	-.05		.05		.02	-.09	.0[illegible]
		60 Selected Adults	Intelligence Test	.16		.19		.17	.07	.2[illegible]

(1) A Median Percentile Rank above 100 indicates a correlation with 'g'.

(2) See Chapters VI and VII below.

Table (24) continued

B - K - D Tests

Investigators	Date of Research	Subjects	Intelligence Tests	T.Mem	Q	I	T.Mov	Time	RD	RI	PD	PI	MT	Total
				K - D Tests										
Chase*	1931	82 Feeble-Minded Children	I.Q.Range 45-77	X	X	X	X	X	.	X		X		
				Average P.R. = 35.0 for the tests marked with X.										
Newkirk*	1934	1000 Students	Otis Intelligence Test											.34
Farnsworth	1934	67 Music Students	Thorndike Test of Intell.	.25	-.04	.04	.15	.00	.19	.07	.03	.00	.22	
		67 Music Students	American Council Psych.Exam.	.06	.09	-.01	.22	.20	.03	.58	-.12	.33	.38	.26
Drake*	1940	163 English Students	Army Beta Type				.13						.06	
Lambert*	1941	1024 Children Age = 11	Kuhlmann-Anderson											.33
Robertson*	1941	Over 5000 Children Aged 8-20	Otis and Kuhlmann - Anderson											.33
Taylor	1941	150 Freshmen Students	Detroit Advanced	.38	.37	.15	.04	-.05	-.02	.07	-.07	.17	.21	
Lehman	1950	450 Musicians and Col.Stu.	Otis Intell.Test											.18

Investigators	Date of Research	Subjects	Intelligence Tests	Kwalwasser Music Test Full Battery: Melodic Sensitivity	Harmonic Sensitivity	Total
Radley*	1952	550 Children	New California Shorthand			.51
Bentley	1955	(87 Instrument playing (students	(California test of (Mental Maturity			.34
		(95 Non-musical (playing students	" " "			.48
Taylor	1941	150 Freshman Students	Detroit Advanced	-.07	.02	

* = Mentioned by Kwalwasser 1955 who summarized the findings of a number of unpublished Master's and Ph.D. Theses

K-D Tests (1) Tonal Memory, (2) Quality, (3) Intensity, (4) Tonal Movement, (5) Time, (6) Rhythm, (7) Rhythm Imagery, (8) Pitch Discrimination, (9) Pitch Imagery, (10) Melodic Taste and Total.

Table (24) Continued

C : Drake Tests

Author	Date of Research	Subjects	Intelligence Tests	Drake Tests Memory	Drake Tests Rhythm
Karlin	1941	120 Students	Cattell Scale III	.06	
Drake	1957	230 College Students	Otis Advanced	.28	
	1940	163 Music Stud. Age-7-16	Army B. Type	.27	
	1957	20 High Sch:Children	Cattell Culture Free	.05	.10
	1957	61 Psychol.Students	Otis Advanced		.00
	1957	130 Students	A.C.E. College		-.03
	1957	130 Students	Cattell Culture Free		.05
Rainbow	1965	61 Students in grades 4-6	Lorge Thorndike Intell. Test	.41	
		112 Students in grades 7-8		.42	
		88 Students in grades 9-12		.42	

D : Lowery Tests

Author	Date of Research	Subjects	Intelligence Tests	Lowery Tests T.	Mem.	Cad.	Phr.
Lowery	1929	Girls aged 12-14	Tomlinson West Riding Set Y		.44	.44	.00
Drake	1940	163 Boys aged 13	Army Beta Type			.06	

E : Mainwaring Tests

Investigator	Date of Research	Subjects	Intelligence Tests	Mainwaring Tests Pitch	Rhy.	Recl.
Mainwaring	1931	83 Elementary Sch. Children	N.I.I.P. Group	.53	.46	.04
Fieldhouse	1937	34 Grammar Sch.Boys	Spearmen's Measures	.39	.32	
		96 Normal Students	Simplex Jun.Intell.	.35	.09	
		50 Monotones	Simplex Jun.Inttll.	.18	.11	

F : Lundin Tests

Investigator	Date of Research	Subjects	Intelligence Tests	Total
Lundin	1949	113 Music Students	California Maturity: Total	.15
			" Language	.13
			" Non-Language	.25
		155 Unselected Music Students	" Total	.24
			" Language	.19
			" Non-Language	.22

Table (24) Continued

G : Gaston Tests

Investigator	Date of Research	Subjects	Intelligence Tests	Gaston Tests 19-23	24-28	29-33	34-40
Bentley	1955	87 Inst.Playing Stu.	California Test of Mental Maturity	.15	.32	.29	.29
		95 Non-Mus.Playing Stu	" " " "	.11	.18	.16	.25

H : Whistler-Thorpe Tests

Investigator	Date of Research	Subjects	Intelligence Tests	Whistler-Thorpe T Rhy.P	Rec	Mel. ..	Pit. Dis.	Rhy.
Bentley	1955	87 Inst.Playing Stu.	California Test of Mental Maturity	.25	.22	.32	.35	.26
		95 Non-Mus.Playing Stu.	" " "	.00	.24	.22	.32	.01

I : Franklin Test

Investigator	Date of Research	Subjects	Intelligence Tests	T.M.T. Group	Indiv.
Franklin	1956	79 Training Col.Stu.	Anderberg		-.11
		157 Training Col.Stu.	Thurstone Mira	.18	.18

J : Oregon Music Discrimination Test

Investigator	Date of Research	Subjects	Intelligence Tests	Oregon Music Discrim. Pref. Sc.	Rhy.	Har.	Mol.	Tot.
Revner	1931	74 Col.Stu.	(Minnesota Coll (Ability Test					.15 (1) .17 (2)
Badek[3]	1968	171 Unselec.Adults	Cattell IPAT Scale III	-.04	.12	-.01	-.02	.00
		60 Selec. Adults	" " "	.09	.29	.23	.27	.28
		171 Unsel. Adults	(Saleh Pict. Intel.	.18	.13	.14	.08	.21
		60 Selec.Adults	(Test	-.01	.07	.03	.09	.06

(1) Two Version Form

(2) four Version Form

(3) See Chapter VII below

Table (24) Continued

K : Bentley Measures of Musical Talent

Investigator	Date of Res.	Subjects	Intelligence Tests	Bentley Tests P.	TM.	Chd.	Rhy.	Tot.
Bentley[1]	1963	166 Children aged 10-12	(Moray Hse.Verbal (Reasoning	.30	.25	.24	.34	.38
Kadek	1968	111 Unselec.Chiln.	Cattell IPAT Scale II	.23	.16	.27	.06	.25
		74 Select. Chiln.	" " " "	.46	.41	.18	.11	.21

(1) In another check on 149 boys and girls, all aged 11 years and all of I.Q. = 100 or above, it was found by using Chi-squared that there was no significant association between I.Q. and the tests except in the case of the pitch discrimination.

Table (24) Continued

L : Wing Standardized Tests of Musical Intelligence

Investigator	Date of Research	Subjects	Intelligence Tests	Wing Tests							Total	Total
				Chds	P.	Mem.	Rhm.	Har.	Intsy	Phsg	1-3	1-7
Wing	1948	23 Girls	Simplex Junior									.30
		43 Boys	Burt's Reasoning									.32
		24 Adults	Terman & Merrill									.40
		24 Adults	Cattell IPAT Scale IIIa									.34
		454 College Students	Group 33									.20
Coutlhard	1952	32 Grammar Sch.Boys										.04
Holmstrom (1)	1957	900 Eight yr.old Childn									.37	
Bentley	1955	87 Instrument Playing St.	California Test.Ment.Mat.	.21	.39	.37	.22	.18	.01	.02		.39
		95 Non-Playing Students	California Test.Ment.Mat.	.22	.39	.26	.03	.25	.17	.11		.39
Frankoin,	1956	79 Training Coll.Students	Anderberg	.09	-.10	-.02	.00	-.19	.20	.04		
		157 Training Coll.Students	Thurstone Mira	.09	.12	.20	.23	.21	-.03	.08		
Whittington	1957	24 Music Adolescents	Raven s Matrices	.36	.18	.42	.40	.47	.52	.20		
		" "	" "	.21	.63	.32	.20	.17	.00	.40		
Edmunds	1960	60 Sec.Mod.Sch.Childn. in A & D Streams	Cornwell Intelligence	-.07	.33	.39					.28	
		58 Sec.Mod.Sch.Chidn. in F St. & E.S.N.		-.02	.36	.47					.39	
Shuter	1964	200 Royal Marine Sch. of Music Boys	Admiralty Abstraction								.18	.15 (3)
Sadek (2)	1968	171 Unselected Adults	Cattell IPAT Scale III	.13	.08	.12						.15
		60 Selected Adults	" " "	.05	-.07	.13						.00
		171 Unselected Adults	Saleh Pict. Intelligence	-.02	-.02	-.01						-.01
		60 Selected Adults	" " "	.01	-.11	.13						.02

(1) In Wing 1957 The tests used are a modified form of tests 1,2 and 3.

(2) See Chapter VII below.

(3) Total of Tests 4-7

Table (24) Continued

L : Wing Standardized Tests of Musical Intelligence

Investigator	Date of Research	Subjects	Intelligence Tests	Wing Tests							Total	Total
				Chds	P.	Mem.	Rhm.	Har.	Intsy	Phsg	1-3	1-7
Wing	1948	23 Girls	Simplex Junior									.30
		43 Boys	Burt's Reasoning									.32
		24 Adults	Terman & Merrill									.40
		24 Adults	Cattell IPAT Scale IIIa									.34
		454 College Students	Group 33									.20
Coutlhard	1952	32 Grammar Sch.Boys										.04
Holmstrom (1)	1957	900 Eight yr.old Childn									.37	
Bentley	1955	87 Instrument Playing St.	California Test.Ment.Mat.	.21	.39	.37	.22	.18	.01	.02		.39
		95 Non-Playing Students	California Test.Ment.Mat.	.22	.39	.26	.03	.25	.17	.11		.39
Frankoin,	1956	79 Training Coll.Students	Anderberg	.09	-.10	-.02	.00	-.19	.20	.04		
		157 Training Coll.Students	Thurstone Mira	.09	.12	.20	.23	.21	-.03	.08		
Whittington	1957	24 Music Adolescents	Raven s Matrices	.36	.18	.42	.40	.47	.52	.20		
		" "	" "	.21	.63	.32	.20	.17	.00	.40		
Edmunds	1960	60 Sec.Mod.Sch.Childn. in A & D Streams	Cornwell Intelligence	-.07	.33	.39					.28	
		58 Sec.Mod.Sch.Chidn. in F St. & E.S.N.		-.02	.36	.47					.39	
Shuter	1964	200 Royal Marines Sch. of Music Boys	Admiralty Abstraction								.18	.15 (3)
Sadek (2)	1968	171 Unselected Adults	Cattell IPAT Scale III	.13	.08	.12						.15
		60 Selected Adults	" " "	.05	-.07	.13						.00
		171 Unselected Adults	Saleh Pict. Intelligence	-.02	-.02	-.01						-.01
		60 Selected Adults	" " "	.01	-.11	.13						.02

(1) In Wing 1957 The tests used are a modified form of tests 1,2 and 3.

(2) See Chapter VII below.

(3) Total of Tests 4-7

Seashore's tests. However in the present study, in the selected children's group the correlation with the total of the Seashore tests (recent version) reaches 0.72. Our results may confirm to some extent the findings of Burt (1909) who obtained a sizeable correlations between intelligence and pitch discrimination. His explanation of this is that the development of man's intelligence depends on his power of speech and this in turn depends upon auditory acuity. However this does not imply that those who are very superior in general intelligence are likely to perform better in sensory tests. Hollingworth (1926) gave evidence that when he tested intellectually gifted children with I.Q's ranging from 135 to 190 (their ages ranged between 8 years to 11+) with the Seashore tests, "there was no clearly defined musical sensitivity in the case of children who rate very high in intelligence." Hollingworth also stated that "the pupils met intelligence test situations much better than the average for people of their age but met the music test no better than the average.

Wing (1954) comments on the correlations with his own tests that there is "agreement between a low I.Q. and a low M.Q. and a disagrement was found when a high I.Q. was present with a low M.Q." Ross (1937) studied the relationships between intelligence, musical talent and scholastic achievement by comparing scores on the Terman group test of Mental ability, the Seashore tests and the Stanford Achievement test, from V. His subjects included children in grades 5-12 and included Indian, and Japanese children and other native children. He found that pupils in grades 10-12 who elect music are slightly superior in intelligence and those whose scores indicated superior musical ability tend to be superior in intelligence. He also declared that deficiency in musical talent has a definite relation to inferiority in intelligence.

The results of Hollingworth, Wing and Ross indicate that low intelligence is linked with low musical ability, and high musical ability is linked with high intelligence, but high intelligence does not necessarily indicate the possession of higher musical ability.

Smiths' (1914) explanation of high correlation between pitch and 'g' was that the pitch discrimination test depended partly on ability to learn and therefore on the brightness and reliability of the subject.

Lowery (1929) stated that "general intelligence does play an appreciable part in the formation of the judgment in connection with (his) memory and cadence tests", and that "good phrasing in musical performances is not always obtained even from expert musicians, though where it is present it stamps the hall-mark of the real artist".(p.403).

Edmunds (1960) found that the highest correlation between intelligence and the memory test in Wing's battery. Vernon indicated that "Memory depends on intelligence and is not an independent faculty of the mind". Thus a high correlation is to be expected between 'g' and memory.

Franklin (1956) stated that "a certain minimum of general intelligence must exist in order for o's (subject) to learn the test instructions and understand what the whole thing is about".(p.104). On the other hand Burt stressed the important part of intelligence in the development of musical ability. In a commentary notice on Mainwaring's work (1947, p. 87) he wrote: "A most important element in musical appreciation (as in all forms of aesthetic appreciation) is general intelligence, regarded as an integrative capacity... no child can be a really good musician unless he has high intelligence as well as specific aptitude".

To conclude this section, it is found that general intelligence is rather essential in performing musical ability tests, though the possession of high intelligence does not always indicate the possession of superior musical ability. Intelligence may be more important with younger or duller children than with adults. This is confirmed by Burt's work with the Seashore tests, and by the work done by Edmunds (1960) who stated that "low intelligence and low musical ability appear to be closely related, but when a certain level of general ability is reached, approximately 90 I.Q.

intelligence no longer plays a significant part, i.e. children may have either high or low musical ability". In the present investigation much the highest correlation coefficient was obtained between general intelligence and musical ability tests with the selected group which covered a wide range of age (9-15) where the younger group of children was included.

6 Relationship of Musical Ability to Other Abilities

Other investigations have been concerned with the relation of musical ability to certain other artistic or scientific aptitudes. In most of these studies the reported coefficients tended to be rather low which may indicate the specific nature of musical ability. In other researches, the investigators obtained their data by questionnaire Table (25) summarizes the studies in which correlation coefficients were obtained, and a brief discussion of the other investigations where no correlations were obtained will follow.

One of the early investigations was carried out by Bartsch * to investigate the relationship between musicality and general scholastic achievement. His survey covered 200 moderately musical pupils at a Teacher Seminary. He found "no clear cut relationship between musical aptitude and general intellectual ability as testified by the term reports." The ability of the highly musical was much the same as that of pupils of moderate musical talent, the ratio between them being 46.3 to 47.7. On the other hand, Schüssler (1916) X in a study of 200 musical and 200

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* In Revesz (1953 P. 161-162)

Table (25)

Correlation Between Musical Ability and Other Abilities: Other Investigations

Investigator		Subjects	Music Tests	Foreign Language	Native Vocabulary	Language and Literature			Art	Visual Perception		Mech.	Maths.	Spatial
						Spelling	Literature	Poetry						
Hevner	1930	74 Music Students	Hevner Appreciation					.16 (1)	.28 (3)					
Carroll	1932	133 College Students	Hevner Appreciation				.12 (2)		.16 (3)					
Morrow	1938	112 Male Psychology Students	K-D tests (4)						-.10 (Ave.)			-.13 (Ave.)		
(William & Winter & Woods	1938	(70 Girls aged 11-14; 75 Girls aged 13-15; and 49 Girls aged 16-18.	Appreciation				.26							
Karlin	1941	120 College Students	Drake Memory Test		.14		.12							
Coulthard	1952	32 Grammar School Boys	Wing Total Score	.53 (5)										
			Wing Tests 1-3	.42 (5)										
Franklin	1956	157 Training College Students	Seashore Pitch		.26					-.04 (8)	-.06 (9)			
			" Memory		.17					±.04	.14			
			Wing Chords		.13					.01	-.10			
			Pitch		.18					-.05	-.11			
			Memory		.28					.03	-.01			
			Rhythm		-.01					.15	.04			
			Harmony		.27					-.01	.02			
			Intensity		.00					.01	-.02			
			Phrasing		.13					-.05	-.08			
			Franklin TMT Indvl.		.23					.16	.23			
			" Melodic Rhythm		.19					.09	.19			
Drake	1957	19 Music Students	Drake Rhythm						.00					
		166 Belgian Boys	Drake Rhythm						.14					
Edmunds	1960	60 Secondary Modern A & D Stream	Wing 1-3		.33 (6)									
		58 Secondary Modern F Stream and E.S.N.	Wing 1-3		.24 (6)									
Shuter	1964	200 Royal Marine School of Music Boys	Wing 1-3			.12 (7)						.26 (7)	.07 (7)	.21 (7)
			Wing 4-7			.12 (7)						.02 (7)	.05 (7)	-.03 (7)

1 = Abbott & Trabue's exercises in Judging Poetry

2 = Carroll Prose Appreciation Test

3 = Meir-Seashore Art Judgment

4 = From K-D battery: Tonal Memory, Tonal Movement, Rhythm Discrimination and Melodic taste.

5 = Oral French test which includes sub-tests of Pronunciation, Accent, Intonation, Phrasing and Fluency. The test is devised by Coalthard.

6 = Burt's Reading Test.

7 = Admiralty Spatial, Mechanical, Mathematical and Spelling Tests.

8 = Gottshald's Figures.

9 = P - Test.

unmusical intermediate school students, found that the unmusical showed a lower efficiency level in school subjects. In the writer's opinion, Schüssler's results could be explained in terms of general intelligence which largely determines progress in school, and which has been shown above to have some correlation with musical abilities.

Haecker and Ziehen (1922)* found a relationship between musical talent and drawing and literary talent. The latter was more relevant to music than the former and more apparent in males than females. Fies (1910) found that great musicians and their parents have often been distinguished in other arts and literature. However, in a study of a normal group of pupils by Williams, Winter and Wood (1938), the correlation coefficient between musical appreciation and literary ability was only .26. In another research by Carroll (1932), the coefficients obtained with the Hevner appreciation were still lower (.12). Karlin (1941) also reported a low correlation between Drake's memory test and literary ability.

Morrow (1933) obtained negative correlation coefficient between the Meier-Seashore Art Judgment test and the tests he used from the K-D battery. He concluded that a closer relationship existed between Artistic and Mechanical abilities than between Musical ability and either Artistic or Mechanical abilities. Shuter (1964) also obtained very low correlations between Wing's tests 4-7 and spatial and Mechanical abilities.

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* In Revesz (1953 P.161-162)

Table (26)

Correlation between Musical Ability tests and Other Abilities
Present Investigation

Music Tests		Arabic A	Arabic B	Arabic C	Arabic D	English D	Mathematics A	Mathematics B	Mathematics C	Spatial I C	Spatial I D	Spatial II C
Seashore	Pitch	.08	.59	.08	.20	.15	.16	.57	-.09	-.06	.03	-.04
	Rhythm	.05	.56	.05	.05	.04	.20	.55	.10	.09	.26	.05
	Time	.12	.38	.10	.03	.01	.19	.30	.11	.13	.24	.10
	Tonal Memory	.20	.63	.25	.16	.32	.30	.49	.09	.03	-.07	.12
	Total	.17	.72	.26	.20	.17	.30	.62	.08	.04	.15	.11
Bentley	Pitch	.04	.46				.12	.29				
	Tonal Memory	.02	.41				.17	.12				
	Chords	-.07	.18				-.10	.07				
	R. Memory	-.01	.21				.09	.03				
	Total	-.02	.43				.08	.21				
Wing	Chord Analysis			.12	.05	.32			.05	.00	-.35	.01
	Pitch Change			-.03	-.06	.34			-.04	.00	-.35	.09
	Tonal Memory			.09	.15	.27			.02	.04	-.12	.07
	Total			.07	.08	.37			.03	.02	-.33	.09
Oregon Music Test (T)				.04	.02	.33			.06	-.02	-.04	.16
Farman Music Notation				.10	-.02	.15			-.01	.22	.05	.06
Melody Identification		.01	.34	.06	.15	.43	.08	.05	.05	.05	-.15	.14
Rhythmic Identification		.30	.32	.20	.08	.21	.30	.12	.08	.17	-.01	.18
Interval Recognition		.18	.37	.11			.13	.09	.12	.07		.18
Interval Estimation				.13	-.05	-.10			-.05	.20	.48	.12
Fluency				.17	-.06	.24			-.05	-.09	-.67	-.07
Closure I				.09	.01	.20			.02	.07	-.33	.10
Closure II					.25	.05					.15	

I = Likert & Quasha: The Revised Minnesota Paper Form Board.
II = Smith, M., N.F.E R. Spatial Test I.
A = 111 Unselected Children with age range 12-15+.
B = 74 Selected Children with age range 9-15+.
C = 171 Students at Teacher Training Schools (Music Section) .
D = 60 Highly selected groups who study in Higher Institutes of Music.

She concluded that "taste and appreciation would seem to be less closely related to intellectual ability than are aural acuity and Memory". (P.375).

However, the differences between the reported results suggest that the relationship between musical and other artistic abilities depend greatly on the particular groups tested and the tests used rather than on the cognitive factors that the tests claim to measure.

The relation between musical ability and mathematical talent seems to have been of interest to many investigators. Howes (1958) stated that "the analogy between mathematics and music has been recognized from antiquity, and though all attempts to press the analogy, or even to define it, soon break down, it is still recognized by musicians and mathematicians and the rest of us who are neither ..."

One of the early investigations was that carried out by Haecker and Ziehen (1922). Their subjects were 227 musical and 72 "absolutely" unmusical males and 142 musical and 90 "absolutely" unmusical females. Their results indicate a negative relationship between musicality and mathematical talent. Only 2% of the musicial male group were mathematically talented, while 13% of the unmusical male subjects manifested mathematical ability. With the female subjects the number of those with mathematical ability was very small. Pannenborg (1915), (In Révész 1953), supported the findings of Haeker and Ziehen since they reported that out of 52 very musical subjects only 15.4% showed mathematical aptitude, while with 371 averagely musical persons, the percentage was 12.3.

Revesz (1953) also found that 9% of professional musicians have mathematical talent. He investigated the question of whether mathematicians are more musically gifted than others who have specialized in different branches and professions. He obtained his data by questionnaire sent to 582 Dutch mathematicians, scientists and writers. The questionnaire included 17 questions dealing with musical interest, training, activity, aural ability and the inherited capacity of the subjects. Revesz summarized his results in the following table.

Table (27)

Frequency of Musical apititude among Mathematicians, Physicists, Physicians and Writers.

	Musical	Unmusical	Total
Mathematicians	76 (56%)	59 (44%)	135
Physicists	116 (67%)	56 (33%)	172
Physicians	98 (59%)	67 (41%)	165
Writers	78 (71%)	32 (29%)	110
Grand Total	368 (63%)	214 (37%)	582

Revesz concluded that "mathematicians did not show a higher percentage of musicality than other professional groups ... (and) that the prevailing opinion that mathematicians are ordinarily more musical than other groups of intellectuals has therefore been exploded by this investigation." (1953 P.165). Further evidence of the relationship of mathematical and musical ability is given by Wing (1954) and Shuter (1964). Wing correlated the results obtained from his test battery with School Certificate results. He stated that "the correlations between my (Wing's) music test results and the school certificate marks including mathematics were ... low". (1954 P.167). He concluded that "musical aptitude is considered, as far as the present evidence goes, to be largely dependent on specific innate abilities". (Ibid P.169). In Shuter's (1964) investigations the correlation between Wing's tests and the Admirality mathematical tests were lower, (namely .074 for tests 1-3 and .053 for tests 4-7), than with the other entrance tests.

In the present study sub-test, and total scores from the different test batteries were calculated with the mathematics marks obtained from the schools. These marks were obtained from the second term examinations. From table (26) it is apparent that some high positive correlation coefficients were obtained in groups A, B and C with the Seashore battery. Thus the correlation rises to .62 in group B. At the same time a high correlation coefficient of .72 was obtained between the Seashore total and "g" tests. This may largely explain the correlation of musical ability and mathematics since r between mathematics and "g" was also in the 50's. With the Bentley test battery in group A there are some positive and some negative relationships between the individual tests of the battery and mathematics. In group B the positive correlations are comparatively low but a coefficient of .29 is obtained between mathematics and Bentley's pitch test. With Wing's tests and mathematics and also with other tests constructed by the writer very low coefficients are obtained and there are even negative ones with three of the tests namely, Farnum test, Estimation, and Fluency tests.

A positive relationship between music and mathematics is claimed by Vernon. He stated that he "has some evidence to support the popular view of a connection between mathematical qnd musical ability, though he knows of no published proof", (1950). This conclusion was reached in a survey of university musicians: "of 200 odd members of the Cambridge University Music Club and Union during the year 1927-1928, at least 60% were scientists (including mathematicians and medical students), while in the University as a whole the proportion was scarcely 15%", (Vernon 1931 P.117).

If we examine table (25) we find that the highest correlations coefficient are those obtained by Coulthard between his French test and Wing's tests. The coefficients for the perception tests (1-3) is higher than that for the appreciative tests. In the present study, English marks gave higher coefficients than did other school marks with Wing's tests, Oregon test, Seashore's memory, and especially the new melody identification (.43). However Arabic and Mathematics obtained higher coefficients in group B.

Franklin (1956), Drake (1957), and Edmunds (1960), obtained some positive coefficients between music tests and native languages. Thus the general trend of results is in agreement with Coulthard's findings. He concluded that ".... common sense would suggest that the common factor must be ability to distinguish certain sounds, pitch changes and rhythms, (Coulthard 1952).

In the case of spatial ability, positive and negative coefficients with musical abilities were obtained in Shuter's study (1964), and our own investigation. The highest positive coefficient (.48) was between the interval estimation test and the Revised Minnesota Paper Form Board Test. In both tests, the subject has to identify a relation between a gestalt and its constituents. In the case of my interval estimation, the gestalt is a given interval e.g. a perfect fifth which is to be compared with a number of intervals either smaller of greater; while in the spatial test what is required is to imagine how parts will construct a given visual figure. Thus both tests involve the perception of the relationship between two objects either visually or aurally. On the other hand a high negative correlation (-.67) was obtained between the same spatial test and Fluency test (tune completion) which deals more with musical imagination.

To conclude this section, it is found that most of the correlations with other abilities are rather inconsistent and low (except with the Fluency test). However, some high positive coefficients are obtained from the correlations of music tests with languages and mathematics in our study which may indicate that there is some relation between musical and other types of ability.

7: The Intercorrelation of Musical Ability Tests:

The intercorrelations of musical ability tests provides useful evidence of its nature. If these intercorrelations are high, it would indicate that musical ability is a rather undivided talent, while low intercorrelations indicate the opposite.

Tables are given below in which the intercorrelations of tests obtained from different investigations are combined. Through these tables information may be obtained on the nature of the tests and what they measure.

1. The Seashore Tests of Musical Talent

Most investigations carried out in the field of musical ability have used this test battery either in its older or recent forms, and many of these include tables of intercorrelations. The writer was able to classify 336 coefficients reported by different investigators.[X] Table (28) below summarizes the coefficients obtained from the intercorrelation of each test with the other five tests, the range of coefficients and the median.

Most of the coefficients are positive but not very high though occasional studies such as those of Gaw (1928) and Broom (1929) report coefficients above .90.

It has been stated by Spearman (1927) that the tests have no common factor, and that they measure specific factors only.

[X] (1) Seashore & Mount (1918); (2) Seashore (1919); (3) Seashore,R (1926); (4) Weaver (1924); (5) DeGraff (1924); (6) Hollingworth,(1926); (7) Ruch & Stoddard (1927); (8)Kwalwasser (1927) (9) Gaw (1928); (10) Brown (1928); (11) Broom (1929); (12) Salisbury & Smith (1929); (13) McCarthy (1930);(14) Larson (1930); (15) Farnsworth (1931) (16) Mursell (1932); (17) Fieldhouse (1937); (18) McLeish (1950); (19) Franklin (1956); (20) and the present writer.

The Intercorrelation Of Seashore Tests

Table (28)

Tests	Range of Coefficients 1.00-.91	.90-.81	.80-.71	.70-.61	.60-.51	.50-.41	.40-.31	.30-21	.20-.11	.10-.01	.00-	-.01- -.10	-.11- -.21	Tot. of Coef.	Med.
Pitch	1	5	3	1	10	21	22	33	24	5	-	-	-	125	.312
Intensity	3	5	-	2	3	10	15	28	22	12	1	3	-	104	.255
Time	2	4	1	-	7	13	20	36	20	10	1	2	-	116	.274
Consonance	1	4	2	-	3	6	17	23	27	18	-	4	1	106	.218
MemOry	-	5	3	5	14	26	16	21	19	8	1	3	-	121	.355
Rhythm	-	5	-	2	8	14	14	21	17	12	-	-	1	94	.286
Total of Coefficients	4	13	5	5	23	47	54	83	63	30	2	6	1	336	.285

This statement seems to be untrue to the extent shown by the intercorrelations in our table, since according to this statement, one could expect that most of the coefficients will be low and at least most of them will tend to fall below .30, which is not the case here. On the contrary it is clear that the Seashore tests tend to form a factor of their own in which tonal memory is the most highly loaded.

In other studies, the investigators have correlated tests from different batteries which seem to measure the same traits. Drake, (1939), reported correlations of .11 and .02 between his rhythm test and Seashore's. Similarly, Fieldhouse (1937) obtained correlations of .14 and .01 between Mainwaring's and Seashore's rhythm tests. However Lundin (1949) found a rather higher figure namely .20. for his own test with Seashore's. Sanderson (1933) correlated three of Seashore's tests with the corresponding ones from the K-D test battery. The coefficients were .43 for the pitch tests, .27 for the intensity tests and .48 for the memory tests. These coefficients are higher than those reported by other investigators. However, Foulds (1959) found a correlation coefficient of .53 between Seashore's and Wing's Pitch tests, and Franklin (1956) obtained .49 and .40 between the same tests. In the present study correlation coefficients are obtained between Seashore's tests on the one hand and both Wing's and Bentley's on the other hand. The highest coefficients are found between the memory tests (1) in both batteries.

(1) See Chapters VI and VII below.

It will be noticed that, when tests are based more on musical materials the correlations are higher. This is true in the case of Seashore's memory test, which is considered the most musical as compared with other tests in the same battery. In Sanderson's study the highest coefficient reported was that of the memory test and Lundin (1958) found r = .56 between his memory test and Seashore's. Franklin also reported comparatively high figures between Wing's and Seashore's memory tests namely .64 and .75.

2. Intercorrelations of K-D tests.

Both Farnsworth (1934) and Manzer and Morowitz (1935) used the K-D test battery with large populations. Manzer and Morowitz tested 500 college students and Farnsworth studied the scores of subjects from several different grades. The range of coefficients reported are summarized in table (29) below.

Table (29)
The Intercorrelations of K-D Test Battery

No. of Coefficients in each category.	Range of Coefficients						Total
	.41-.30	.29-.10	.09-.01	.00	-.01 --.09	-10--.29	
	21	89	54	7	9	1	181

The coefficients reported are even lower than those obtained by the Seashore tests. The highest coefficient (.41) was obtained between the Tonal Movement and Memory tests and the lowest -16 is from intensity and Tonal Movement in Farnsworth data. The coeffitients obtained by Manzer and Morowitz are all positive but rather low. They concluded that "the findings of the study supports the view that the musical aptitudes and achievements measured by these tests in this group of students, are to a large extent, independent variables. That is to say, musical ability, to the extent that it is measured by these tests, is not a unitary ability, but is, rather, a complex of several separate abilities each of which may vary independently of the others". (P.336). Another obvious reason for the low correlation is that the K-D tests are too short to be reliable.

3. The Intercorrelations of Wing's Tests:-

The information about the intercorrelation of Wing's tests is obtained from Wing's data (1941), Franklin's (1956), Whittington (1957), Shuter (1964) and the present study.

The coefficients obtained from these investigations are summarized in table (30) below.

Table (30)
The Intercorrelation of Wing's Tests

No. of Coeff. in each category.	Range of Coefficients								Total
	.66-.50	.49-.30	.29-.10	.09-.01	.00	-.01--.09	-.10--.29	-.30--.32	
	19	51	82	32	4	20	7	1	216

The coefficients reported by Wing and Whittington are all positive and rather high. Franklin also obtained high positive coefficients except for test 4 with 6 and 7. The lowest coefficients were obtained from Shuter's data. In our study the intercorrelations are all positive, the lowest being .10 between the chords and pitch tests in the unselected group, and the highest being .50 between the pitch and memory tests in the selected group of adults. In the previous studies, the highest coefficient, namely .66 was obtained by Whittington between the pitch and memory test, while the lowest namely -.32 occurred in Shuter's data between the pitch and the loudness tests. However, in all studies except Shuter's there are positive high correlations between the memory and other tests, which indicates the importance of this ability in performing these tests, as was the case with other batteries. Although the intercorrelations between the tests are not very high, a general factor is always reported by those who used the tests. The low intercorrelations may be due to the fact that the battery, although based on musical material, includes perceptual and appreciative tests which call for different types of reaction. The former requires discrimination while the latter type depends on aesthetic judgment.

In correlating the rhythm test from Wing's battery and that of the Franklin - Revesz rhythm tests, Franklin reported the following coefficients:-

1. Wing's Rhythmic Accent with Revesz-Franklin Rhythm without music r = .28.
2. Wing's Rhythmic Accent with Revesz-Franklin Rhythm with music r = .16.

3. Wing's Rhythmic Accent with Franklin's Drummed Rhythm r = .05

4. Wing's Rhythmic Accent with Franklin's Melodic Rhythm r = .18.

The four different coefficients just mentioned indicate the dependence of the correlations on the nature of the tests. Thus the lowest figure is obtained with the drummed test.

The Intercorrelations of Lundin's Tests:

Lundin (1949) gave the intercorrelations of his tests in two groups and these are shown in table (31). The range of the coefficients is rather high and positive for all the tests. The upper lines represent the data from 195 unselected subjects and the lower lines from the musical group (N= 167).

The second set of figures appears to be somewhat larger. In both groups tests 1, 2 and 4 have the highest intercorrelations.

Table (31)

The Intercorrelations of Lundin's Tests

Tests	1	2	3	4	5
1. Interval Discrimination		.48 .48	.30 .55	.47 .59	.23 .38
2. Melodic Transposition			.22 .36	.53 .53	.32 .35
3. Mode Discrimination				.52 .49	.19 .28
4. Melodic Sequence					.31 .39
5. Rhythmic Sequence					

While test 5 has lower coefficients throughout Lundin concluded that "while we may be measuring for the most part different kinds of musical behaviours, they are quite highly related, rhythmic sequences showing a lower degree of relationship to the others". (P.12).

The Intercorrelations of Bentley's Tests

Bentley's battery of test has not been used by many investigators since it is newly constructed. However, the author' has provided a table of the intercorrelations, and these are shown in Table (32) along with the figures obtained from the present study in two groups (111 unselected and 74 highly selected children).

Table (32)

The intercorrelations of Bentley's Tests (1)

Tests	Pitch Disc.	Tonal Memory	Chord Analysis	Rhythmic Memory
Pitch Discrimination		.47 .55 .50	.40 .42 .34	.25 .42 .35
Tonal Memory			.41 .31 .42	.34 .39 .61
Chord Analysis				.40 .32 .40

The coefficients are all positive and rather high. The highest coefficient .61 is obtained between the two memory tests with the selected group obtained in the present study, and most of those obtained by the present writer are rather higher than those given by the test author. The lowest coefficient is, given by the author, between the pitch and rhythmic memory test and, Bentley indicated that this is not statistically significant. He attributed this finding to the differences between the tonal and rhythmic aspects of learning music. It was this that led him to construct two separate memory tests. Our coefficients are all

(1) The intercorrelations in line one is given by the test's author, while lines two and three are obtained from the unselected and selected groups respectively.

significant at the .01 level, possibly because there is less differentiation among oriental than western subjects.

To conlude this section, it is found that:-

1. The K-D test battery has the lowest level of correlation between its subtests, showing that they tend to measure independent variables.
2. The intercorrelations of the Seashore test battery are usually positive but seem to depend largely on the memory subtest.
3. When tests are more based on musical material, higher coefficients are reported.
4. When corresponding tests from different batteries are intercorrelated, the coefficients are often extremely low, though higher ones are obtained from memory and pitch tests. These seem to be the most important factors as measured by the tests reviewed.
5. Generally the level of coefficients is much affected by the nature of the particular tests and the populations tested.

8. The Determination of the Nature of Musical Ability by Factor-Analysis

"Factor analysis is a technique for examining a table of all the intercorrelations among a set or battery of measures which has been administered to a single group of examinees in order to:-

1. Ascertain the minimum number of traits or factors which will account for all the observed relationships among the tests.
2. Determine the extent to which each factor is measured by each of the tests included in the battery ......"
Helmstadter (1966 P.93).

Thus the factor analysis method should give us information about the nature of musical ability as far as the tests used are able to measure it accurately. However, the information obtained usually depends on the technique of analysis, and the samples tested.

Burt (1924) stated that "there was evidence of a special or group factor for musical "ability" existing over and above general intelligence". The data on which he based his conclusions was obtained from experiments carried out by Pelling and himself for purposes of educational and vocational guidance, partly in L.C.C. schools and partly at the National Institute of Industrial Psychology. The novel features in his approach consisted in the addition of a number of more complext test-items, intended to measure "the Gestalt qualities of musical understanding, as contrasted with the atomistic approach adopted by Seashore and most other investigators hitherto". (Burt 1932: In Wing 1948).

The tests used by Burt and his Collaborators included not only tests of the more elementary processes, discrimination of pitch,rhythm, loudness, etc., but also appreciation and melody, harmony, short musical passages, longer extracts and altered versions given either by piano or recorded. Paper and pencil tests were also included e.g. marking well known tunes in order of preference for a concert performance.

Spearman (1927) gives a different view from that expressed by Burt. He stated that "So far, no analogous broad factor has presented itself elsewhere. Most of all, perhaps, it might have been expected in the sphere of music, where not only innate instinct but also environmental encouragement are incomparably more favourable for some individuals than for others. And yet just here the existence of the expected broad factor has been convincingly disproved; the abilities to appreciate for instance, the relations of pitch, loudness, and rhythm have extremely low inter-correlations; no more, in fact, than must be attributed to "g" alone". (P.340).

Spearman claimed to show by his tetrad differences technique that the Seashore tests fail to reveal any common group factor of musical ability, which may indicate either that there is no such factor, or that the tests cannot reveal it, even though it may exist. However, Burt's view is supported by the findings of different researches done by Wing (to be detailed) in the field of music and also by William, Winter & Woods (1938) in their study of Literary Appreciation. Moreover McLeish (1950) reported that he obtained a general factor of musical ability even when he used the Seashore tests.

There are many factorial studies in the field of musical ability which will be reviewed in historical order below.

Vidor (1931) carried out a research on musicality using only 35 children, without applying formal factorial techniques. She claims the highest correlations (i.e. general musical factor saturation) for creative tests such as completing melodies, or making up melodies to fit rhythms. She found no evidence of distinctive creative and receptive (perceptual) abilities, but thinks that melodic and rhythmic abilities may differentiate. (In Vernon 1950).

Manzer & Morowitz (1935) correlated the scores of 452 students on the K-D tests. Vernon (1950) indicated that the data obtained suggest " a musical training factor (in pitch and Rhythm Imagery, Tonal Memory and Tonal Movement) and a sensory factor (in time, quality, Rhythm, Pitch and Intensity discrimination and tonal memory") (Vernon 1950 P.91).

Fieldhouse (1937) made a study of children's ability to sing, using as subjects 50 children who were identified by their teachers as unable to sing in tune. He also included 96 normal boys as a control group. In his test battery he included Seashore's test, Mainwaring's pitch and rhythm tests together with Simplex Intelligence test, and colour sensitivity E.Test. The scores of the normal and monotones were factored separately using Thurstone's Centre of Gravity method and the factors extracted were rotated.

His first factor for the normal group has positive loadings in all the tests except auditory acuity. The highest loadings were obtained from both the pitch tests and the tonal memory. He designated this factor as a memory factor. This factor was absent in the monotones group. The second factor was highly loaded on tests of consonance, memory and rhythm.

He identified this factor as being a memory comparison factor. The third factor was mainly loaded in intelligence, pitch and time tests, and the fourth was highly loaded on rhythm and intensity tests and was identified as a rhythm factor.

With the monotones all the factors were similar except the memory factor. Fieldhouse concluded that singing out of tune seems to be due to lack of musical memory rather than to defective pitch discrimination as measured by the Seashore and Mainwaring pitch tests.

Morrow (1938) gave five of the K-D tests namely: Tonal memory, Tonal Movement, Time Discrimination, Rhythm Discrimination and Melodic taste along with other tests of mechanical and artistic abilities to 112 male college students. Using Thurstone's Centroid method he obtained four factors, one of which had its highest loading on the tests of musical ability with the exception of the Melodic Taste. A significant finding was that there was little relationship between tests of musical and either mechanical or artistic tests though there was a closer relationship between the tests of artistic and mechanical abilities.

Another study was carried out by Morrow (1941) to determine whether human abilities as measured by special tests are independent or interdependent. He used tests of intelligence, artistic judgment, clerical ability, mechanical ability, manipulative ability and Seashore's battery. The intercorrelations of these tests ranged from .049 to .519 with a mean of .275.

Factorizing the data by Thurstone's centroid method, he was able to identify four factors without rotation. One of these four factors indicated relationships between musical ability and clerical ability on the one hand and between intelligence and Mechanical Ability on the other hand.

Williams, Winter and Woods (1938) reported attempts made by Burt's students to determine the more important components of musical and other aesthetic abilities. They tested 70 girls aged from 11-14 in the top classes of an elementary school, 75 girls aged 13-15 and 49 girls aged 13-16. Their battery included tests of literary appreciation, intelligence and 3 musical appreciation tests. The factors found relevant to music included elementary perceptual ability both auditory and kinaesthetic, auditory and kinaesthetic imagery, a broad factor for aesthetic appreciation generally, a more specialized factor for musical appreciation as such (largely influenced both by musical experience and inclinations) and finally general intelligence. However the most interesting feature of their data seemed to be the general factor which entered into musical, pictorial and literary appreciation.

Woodrow (1939) included Seashore's test battery (earlier version) in a large battery of 52 tests of various types. The subjects were 110 college students. Thurstone's Centroid method was used in factorizing the data, followed by orthogonal rotation. A single factor named music was found common in all the Seashore tests. However this might be expected since, with the exception of Tonal Memory, only one test of each type was included in the analysis. As French (1951) said "the music factor may or may not be a composite of factors such as those found by Karlin. It seems more likely, however, that a factor like loudness, though important to musical activity, is independent of the music factor and by no means limited to music in its function". (P.224).

Drake (1939) (B) gave five of the Seashore tests (all except the consonance), his own musical memory and retentivity tests, and the K-D tonal movement test to 163 boys aged around 13. Using Spearman's tetrad-differences technique, he found a general factor with over 30% variance and strong residual overlap between (1) pitch and intensity; (2) Pitch and tonal movement (K-D); and (3) tonal movement and tonal memory from K-D and Seashore respectively. The major factor was named "memory for auditory items" or "ear mindedness". The explanation of the overlapping between the tests in factors (1) and (2) is quite clear but in the third one Drake suggests that the overlapping may be attributed to memory since the subjects did better in the Seashore memory test than in the K-D tonal movement test. He concluded that the judgment required in the tonal movement test is absolutely different from what is required in the memory test, but it seems that such judgment depends on memory.

Karlin (1941) (A), (B) analysed two batteries of music tests. The first one given to 120 undergraduates included easy versions of Seashore's tests, Drake's musical memory and retentivity as well as two tests of interval discrimination and emotional sensitivity. Thurstone's method of multiple factor analysis and oblique rotation were used and three factors were identified, namely:-

1. Retentivity for musical elements, highly loaded with retentivity, rhythm, emotional sensitivity and musical memory.
2. Tonal Sensitivity: highly loaded with interval discrimination, time and pitch discrimination.
3. Memory for Musical Form: highly loaded with musical memory, time and tonal memory.

The same factors were identified in his re-analysis of Drake's (1939) data. Retentivity for musical elements was common to tonal movement (Kwalwasser's test), Seashore's tonal memory, and Drake's retentivity test. Tonal Sensitivity was loaded with pitch, intensity and tonal movement. And memory for musical form was identified in five tests namely: Rhythm, musical memory, Retentivity, Tonal memory and Time.

With regard to the appearance of two memory factors Karlin said:

"The two memory factors are obscure in outline apart from their retentive nature. It is imperative that future work be directed towards devising many further tests which will serve to accentuate the planes in general and the corners of the structure in particular". (1941 P.64).

In a more comprehensive study, Karlin (1942) gave 27 group auditory tests and 4 group visual memory tests to 200 high school pupils, both boys and girls. Thurston's grouping method of factor analysis was used. This method is based on the same principles as the centroid method "but the factors extracted are nearer the final rotated meaningful primary factors". (P.265). This was followed by oblique rotation and nine factors were extracted, four of which were interpreted as follows:-

1. Pitch quality loaded with the tests of Vocal Pitch Discrimination; Short Impulse Pitch Discrimination; Pure Tone Pitch Discrimination; Quality Discrimination (Seashore's timbre); Tonal Memory and Complex Tone Pitch discrimination. In his view each of these tests included "two stimuli in each discriminating judgment" which differed" in the frequencies of the component parts of the tones" (P.265). In other words, this factor involved discrimination of the pitch of either a pure tone or of some part of a complex tone, and the same function seemed to be responsible for discrimination of both pitch and timbre.

2. Loudness common to the tests of Short-Impulse Loudness Discrimination, Pitch loudness Function, Complex Sound Loudness

Discrimination, Pure Tone Loudness Discrimination, Memory for Male voices and I.Q. The factor involved the discrimination of sound intensity. The Loading of the Pitch-Loudness Function test (in which each item contains two pure tones of constant intensity, complexity, and duration, but differing frequency to be compared in Loudness), indicated that discrimination is based on psychological intensity rather than absolute physical intensity. This means that the same function which "enables the subject to discriminate the different intensities of a single frequency also enables him to discriminate the loudness of two different frequencies of the same intensity". (P.266).

Furthermore, it was suggested that the loading of the I.Q. indicated that loudness would be of a perceptual nature rather than sensory.

3. Auditory Integral Factor: this factor is common to time and loudness discrimination tests such as Unfilled time, Pure Tone Loudness Discrimination, Complex Sound Loudness Discrimination, Filled time, and Sound Breakdown. It was named "Auditory Integral For Perceptual Mass" since the essential element in all the tests listed was "a mass quality dependent on accurance in time for its formation". (P.267).

4. Auditory Resistance: This factor is involved in four tests namely: Haphazard Speech, Illogical grouping, Singing, and Intellective masking. As Karlin stated the factor "appears

to underlie both the domains of auditory synthesis and analysis. Instead of one auditory ability enabling the organism to resist distortion of words due to temporal disarrangement and another ability for resistance to masking noises obscuring meaning, there is apparently a more central ability which serves both purposes". (P.270). However, in this factor making noises seemed to be less important than actual distortion of speech itself.

Other factors identified were named speed of closure, auditory span formation, general span, and incidental closure.

Karlin concluded that he could obtain neither a general auditory factor nor group factors offering a practical approximation to a general factor. However, Vernon (1950) pointed out that most of Karlin's correlations were positive and on his 1st factor before rotation, with 15% of variance, all the tests have positive loadings ranging from .78 for Pitch discrimination to .14 for loudness discrimination.

Generally Karlins factors are not musical ones since music is far more than a composite of a group of auditory abilities. What seems to be an essential feature of musical ability is that it is characterized by changes in the testee resulting from his study or contact with music. For this reason, French (1951) described the factor of music as an "experimental factor". In this regard he said: "the study of music would tend to improve tonal memory, time, pitch discrimination and loudness discrimination, but probably only within the musical situation". Hence it seems that Karlin's tests are not of great interest to the psychology of music since they measure musical ability at the sensory level only.

Wing's Factorial Studies:

Wing carried out a series of factorial studies in constructing his tests. The first one (1936), based on a group of 33 boys of age 11-13, included a number of new tests using musical stimuli: (1) intervals; (2) detection of a note in a chord; (3) the expression in notation of rhythm; (4) the detection of the number of notes in a chord; (5) detecting and stating the direction of change of a single note in a repeated chord; (6) discord resolution; (7) written and played tunes; (8) writing ~~writing~~ down a time pattern, and (9) Judging the more appropriate phrasing. The data were factorized using Thurstone's method.

The first factor gave all positive loadings which ranged between .396. Discord resolving and .779 for the intervals test. Wing identified this factor as a general factor, and stated that "this general cognitive factor must play a large part in determining the efficiency of the children in the various performances ......" (1936 P.103).

Factor II was a bipolar one in which tests (3), (6), (7), and (9) had high negative loadings. Wing stated that this factor "would seem to be a power to analyse explicitly or implicitly the relations between the musical stimuli presented". (P.106). The positive loadings were on tests where the subject has to analyze the stimuli, while the negative loadings are on tests which "depend on impression, or in the test of comparing a written with a played tune which depend on the auditory image summoned by notation". (Ibid P.106).

Factor III the highest loadings appeared in tests (6), (7) and (2) which appear to depend on the power to retain an auditory image of certain notes or combinations of notes.

Two other factors were identified namely "emotional effect" and "notational facility".

In another study (1941) 13 tests were given including (1), (2), (3), (4), (5), (6) and (9) from the previous study and in addition: Notation Reading, Memory, Cadences, Modulation, Harmony, and Intensity. The data were factorized by Burt's Simple Summation method.

Wing again obtained a general factor with positive loadings which ranged betwen .223 for the intensity test and .842 for both the intervals and rhythm tests. The second factor was a bipolar one which divided the tests into two groups. The positive saturations were for tests which depend upon aesthetic judgment, while the tests with negative loadings were those which depend on perceiving.

Wing's major factorial study was conducted after the elaboration and revisions of his test battery. The group consisted of 43 boys aged 14-16. The tests used are those which constitute the Final test battery i.e. (1) detecting a number of notes in a chord; (2) detecting the change of a single note in a repeated chord; (3) detecting changes of notes in a short melodic phrase; (4) Judging the more appropriate rhythmic accentuation in two versions of a melody; (5) judging the more appropriate of two harmonized versions of the same melody; (6) judging the more appropriate mode of varying loudness in two versions of the same melody; and (7) judging the more appropriate phrasing in two versions of a melody.

The factor analysis was carried out by both the simple summation and weighted summation techniques. Three significant factors were identified and intepreted as follows:-

1. General Musical Ability : because it is "responsible for far more of the total variance than any other single factor; moreover, its saturation coefficients are positive throughout" (1941 B, P. 348). The test of phrasing loaded highest (.765) on this factor. This was viewed by Wing as reasonable "for the surest sign that one has understood a new musical piece is one's ability to grasp its formal structure". (P. 349). On the other hand, the test of rhythm showed the lowest loading on this factor (.421). This again seems intelligible. In this regard

Wing said:

"Of all musical capacities the ability to recognize rhythm is probably the most elementary: it develops early, is the most widely diffused, and, as other inquiries would seem to indicate, may exist in almost complete independence of any deeper appreciation of higher developments of musical art, e.g. melodic pattern and harmony .... we may infer therefore, that it requires and implies no very high level of musical capacity", (P.349).

II: The second factor was bipolar and divided the seven tests into two sub-classes. The first included all tests in which the essential task of the listener is to judge the more appropriate musical arrangements on the one hand and the second group includes the tests which involve perception.

In his comment on this factor Wing said:

" This factor is.. reminiscent of a similar bipolar factor that has so often emerged in testing both artistic and other intellectual abilities. Early work on intelligence tests showed that there were two ways of dealing with a structural object: one "involves a complex synthetic activity comparable to the activity popularly described as intuition - the activity whereby we implicitly comprehend the essential meaning or character of a whole without explicitly analysing it into its component parts"[1] ; the other depends upon" an analytic activity which consists essentially in explicitly analysing the whole into its component parts", and, where necessary, educing the relations between them". (Wing 1941 B,P. 351).

This distinction is essentially based on that adopted by Burt. Furthermore, there was some evidence that the natural attitude of the trained musician in appreciating a passage, is synthetic intuitive or relatively passive. This finding may support the fact that the best of Wing's tests of musical appreciation is markedly of a synthetic or intuitive type.

The third factor identified was rather weak since it had signiciant loadings only on those tests which deal with harmony and chord analysis. Negative loadings were obtained on tests which deal with both rhythm and melody. Thus this factor distinguishes "those persons who have a better appreciation for harmony than for melodic or rhythmic line". (P. 351). However Wing did not claim that there was a separate factor for appreciation of rhythm.

The same factors were obtained by both methods, and there were differences only in the size of the loadings. Note that, in all his studies, Wing identified the "general factor" and the factor which divided his perceptial and appreciative tests.

(1) Passage quoted by Wing: From William et al. 1938: Tests of Literary Appreciation. P.290.

Wittenborn (1943) gave 20 tests to 175 High School graduates entering an army technical school, with age range 18-30 years. His main interest was to study attention, but his battery included Seashore's memory test (1939 version). Using Thurstone's Centroid method and orthogonal rotation, seven factors were extracted, and five of these were interpreted. One of these two residual factors was highly loaded on Philip's Alphabet (.499) (a test of attention), Seashore's tonal memory .445; Syllogisms .392 and Otis Directions: 297. This may mean that tonal memory has some relation with both deduction and attention, the deductive aspect being more dominant.

McLeish (1950) analysed Seashore's tests and other variables among 100 undergraduate and post-graduate students using Burt's method of simple summation. A major general factor with its highest loading (.87) on the memory test was obtained. This factor accounted for 29% of the total variance. The correlations of the other measures with this factor were determined. It was found: that age, speed of reaction (cancellation) and musical knowledge have little or no influence on the general factor; that intelligence [as measured by timed (speed) rather than untimed (power) tests] has a small loading, and that scores on the Wing and Oregon tests show the closest agreement. It may therefore be inferred that the general factor in Seashore's battery is closely related to musicial ability on the appreciation side as measured by the Oregon test, and possibly to these interest and performance side as measured by a questionnaire on musical interest and training. Furthermore, it is similar to the ability measured by Wing's tests.

A bipolar factor was also identified in the Seashore battery which accounted for 10% of variance. The positive loadings were rather low, but there were high negative loadings for the Rhythm and the memory tests. McLeish concluded that "this factor appears to contrast tests involving the immediate perception of a change with those involving immediate memory of change". (P.136).

A further analysis of the scores obtained by these same group of subjects with the seven tests included in the Wing battery showed that the general factor of this battery accounts for as much as 45% of the total variance. Two bipolar factors were obtained from Wing's battery which accounted for 10% and 8% of the variance.

McLeish stated that, it was possible, by an appropriate weighting of the Seashore tests to secure "multiple correlation of .72 between the two batteries. Hence McLeish concluded that "Wing's tests measure much the same kind of ability as Seashore's, but measure it at a higher level or at least a different level, namely that of musical meaning". (P.137).

In his Structure of Human Abilities, Vernon (1950) reported an early study in which he gave 17 tests including the Oregon music discrimination test and a musical knowledge questionnaire to about 70 students. He found that the Musical knowledge and the total scores on the Oregon tests had general musical factor loadings of .84, whereas the three Seashore tests included in the battery, namely: memory, rhythm and pitch tests, had loadings of .65, .35 and .38 respectively, and these tended to form a factor of their own.

Vernon concluded that a large common factor is expected from tests which involve perception, memory and judgment of musical material, but that tests of a sensory nature has little relation to this.

Franklin (1956) reported two factor-analytic studies with his TMT. The first was made in the earlier part of 1948 on 79 students in an elementary Teacher's Training College. His battery included his own test, Seashore's Pitch and Tonal Memory, Wing's tests, Revesz-Franklin Rhythm tests (with and without music), and Anderberg's test of general intelligence (involving reasoning, analysis .... etc..) The method of successive approximation was used, and four factors were arrived at after rotation namely:-

I. Perception of Change of pitch: This characteristic is common to all the significantly loaded variables on this factor, namely Wing's Memory and Pitch change, and Seashore's Pitch and Tonal Memory.

II: Synthetic musical talent (or TMT Factor): This factor is significantly loaded with tests TMT, Seashore's Tonal Memory, Wing's Memory and Pitch change, Wing's Harmony, and Revesz-Franklin Rhythm without music. Franklin concluded that TMT was "a higher musical talent function of a synthetizing nature".

III: Rhythmic talent - general intelligence composite: Highly loaded with Revesz-Franklin Rhythm without music, and with music, general intelligence and Seashore's Pitch. However, the significant loading of Seashore's test is not of importance since "when placed in relation to the zero loading in Wing's pitch test an interpretation must be sought in some other direction than that of pitch" (P.158).

IV: A specific common factor which showed its highest loadings on five of Wing's tests i.e. all but memory and pitch change.

In the second factor analysis, the number of testees was 157 (62 men and 95 women). The battery included the same tests from the Wing and Seashore batteries; the Revesz tests were replaced by two original rhythmic tests and a group form of TMT test was substituted. Other non-musical tests namely Gottschaldt's figures, P.test (Perceptical speed), Vocabulary, and Thurstone's-Mira test of general intelligence were also included. The factor analysis was made by Thurstone's analytical method of simple structure. The factors identified are:

1. Pitch Discrimination in Seashore's Pitch and Pitch-Retest, and with relatively low loadings in Wing's pitch change (.25).

11. Tone Memory: In Wing's Memory and Seashore's Tonal Memory. The tone memory component of Seashore's Pitch test has caused a most interesting bipolarity (-.38 and -.29) for pitch and pitch retest respectively). This means that the first factor of the previous analysis has been split into contrasted factors. (See factor I from previous analysis).

III. Melody Memory and Harmony Composite: Loaded with Wing's Memory, Seashore's Tonal memory, Wing's chord analyses and pitch change.

IV: Rhythm Loaded with both melodic and non melodic rhythm.

In addition, two non-musical factors were identified: the first was common to Gottschaldt's figures, and the P.test and the second to the Vocabulary and Thurstone-Mira's test of General Intelligence. Also three specific factors were found for Wing's Intensity, Wing's phrasing and TMT tests respectively.

Whittington (1957) conducted his study in order to assess musical ability and appreciation in the light of Mursell's (1937) premise that "we must try our developed tests upon individuals known to be conspicuously musical and those known to be conspicuously non-musical to try to discover where the most crucial and significant performances are located. Strange to say, this obvious procedure has only been adopted by Stumpf and Revesz - and in each case only a single individual subject was involved".

To compose the "conspicuously musical" group, 24 pupils who had proved themselves both in the theory and practice of music, i.e. reaching the higher grades and obtaining either honours or merit in their examinations, were selected. In all but four cases there was musical activity at home. All of them were active participants in the musical life of their school-orchestra, bands, choral-clubs, &c.... The age of this group ranged from 14-18 years and 6 months.

The selection of the "conspicuously non-musical" group was based on Wing's questionnaire 24 pupils were chosen who showed complete dislike for music, recorded a nil answer to musical activity at home, did not play an instrument and were not interested in learning to do so, and were not keen about school musical activities such as school singing. The ages of these 24 subjects ranged from 15-18.

The two groups were tested by Wing's test battery, the 1947 Raven's Progressive Matrices, and the Minnesota Tests of Manual Dexterity.

The results of the two groups did not show any significant differences in the Intelligence tests but a significant difference at the .01 level was found in musical ability.

For each group a separate factor analysis of the results was carried out using Thurstone's Centroid method. Only one factor was isolated. In the non musical group the factor was loaded in descending order with Pitch change, Phrasing, Raven's Matrices, Memory, Rhythmic accent, Chord analysis, and Intensity. The Harmony test gave a non-significant loading (.29). In the musical group the order of loadings was as follows: Rhythmic accent, Harmony, Chord analysis, Memory, Intensity, Phrasing, Pitch change, and Raven's Matrices.

In interpreting the factor for the non-musical group Whittington speculated that the high correlations of Raven, Pitch Change, and phrasing would suggest that it is the factor of eduction of relations and correlates (i.e., intelligence in Spearman's terms). In his view Pitch change involves "sensitivity to pitch relationships", and phrasing requires "judgment of the more appropriate phrasing of a melody", and for this reason, this test involves "not only the ability to educe relations but also correlates". In this sense, both musical tests involve a certain degree of appreciation of relationships which is the essential characteristics of Raven's Matrices. An alternative interpretation was suggested by the fact that both tests were measuring sensitivity, since pitch change "involved a relationship of two notes ..... and phrasing differentiated between staccato and legato playing". (P.5). However, the factor utilized intelligence in a finer form to appreciate a "gestalt" quality.

On the other hand, in the musical group, the Raven loading was not so high. "Something was therefore operating through the performances of the musical group that was over and above intelligence as measured by the Matrices test," as Whittington stated. The factor was called "musical experience" rather than "musical ability" because the musical group was homogenous and the differences between this group and the non-musical one was highly significant. The factor also involved "an intellectual element not to be confused with Spearman's "g". Furthermore ~~-~~; "The experimental element would certainly account for the high saturation in .... harmony, where ears trained in aural perception would easily detect more melodic lines in which chord progressions were obviously correct. The first factor loading in .... Rhythmic accent was .81. In this test Wing had included classical extracts which were obviously known by members of the musical group, for one had only to study their faces during the test performance to realize that the tunes were familiar." (P.6).

As far as the manual dexterity tests are concerned, they failed to give any significant results.

Fauld's (1959) study was mainly concerned with pitch discrimination. He attempted to examine this ability in both musical and non-musical situations in order to be able to decide the relation of these areas. His battery of test included

Seashore's Pitch and Tonal Memory tests, Lundin's Interval discrimination, Wing's Pitch test, Franklin's TMT, other tests of recognition of certain musical intervals and a test of auditory digit span. This battery was given to 67 freshmen in a music group and 35 unselected freshmen. The results were factorized by the method of Principle Axes and then rotated by extended vectors.

The results showed a general factor with Wing's test having the highest loading (.81) and memory for digits a near-zero loading. Franklin's test had the lowest value in this analysis and failed to discriminate effectively between the two groups. After rotation, a factor was obtained in which Wing's test had a loading of only .237 and Lundin's had a zero loading. Although this factor only deals with pitch as such, Faulds designated it as "Music".

Burroughs & Morris (1962) applied factor analysis in a novel study of musical learning. 100 boys and girls of 13+ years of age were given a theme to sing back. The scores on 8 trials together with the results on Wing's tests 1-6 and Mainwaring's Memory tests, the Southend Intelligence test and a musical interest questionnaire were factorized, using the principal components method. The first eight factors extracted accounted for 87% of the variance; these were rotated orthogonally, as follows:-

<u>Factor I</u> is concerned with Pitch and Wing's tests 1-3. The Memory test and immediate recall of auditory experience also obtained high loadings. The factor is designated as "Memory for Melody". It has loadings at all stages of practice, i.e. all the eight trials, with a tendency to decline.

<u>Factor II Recognition of Musical Shape</u> This factor has its highest loadings in the Intensity and Harmony tests. The loadings on the eight trials appeared to increase in later trials, suggesting that this factor becomes more important as learning progresses.

<u>Factor III</u>: has its highest loading in Verbal intelligence and interest and appears to be a non-musical factor. This tends to decrease after the early trials.

<u>Factor IV</u> has its highest loading in Wing's Rhythmic Accent test (.51). The factor is not sapled in the early trials but builds up to influence later performance. This suggests that in learning the task the acquisition of melody precedes to some extent the acquisition of the rhythm and time elements.

As for the other four factors extracted the investigators stated that these appear to be of very little importance to the learning of a musical theme.

A number of factorial studies of Wing's test battery were carried out by Shuter (1964). Her aim was to compare the results of five different groups namely: two talented groups, one average group and two sex groups and to see in each case how far musical ability depends on a general factor?

Shuter's five groups were as follows: Group I: 41 students of both sexes, who are considered to be very talented, from the Eastman School of Music U.S.A.; Group II consisted of 48 men and 52 women who were considered average in musical ability. Twenty of this group fall in Wing's Grade B, 60 in grade C and 20 in Grade D. Group III were 100 gifted children, all members of the National Youth Orchestra with age range between 12-18. All but 3 of the subjects in this group are in Wing's grade A. Group IV and V consisted of 100 men and 100 women of above average musical ability from Shiefeld Training College. The principle components method was used throughout.

Factor I: in all five groups a broad first factor accounted for 26% to 35% of the variance. The loadings were most consistently and significantly positive in the case of the more musical groups and least so in the average groups. The factor was designated as "a general factor of musical ability whether it is rotated or unrotated. The talent of the highly musical seems more 'unified' or 'integrated' than that of the average person. However the differences appeared to be in degree rather than in kind". (P.385).

Factor II, for the first group split the battery into two parts, tests 6 and 7 having high positive loadings, while all the other tests have high negative loadings especially test 3. In the 3rd group, the positive loadings were obtained from tests 4 and 7 ~~and~~

and with the average group, the factor differentiated Tests 1-3 from 4-7 as in Wing's own studies.

Factor III, for group (1) tests 4 and 5 separate from the battery especially from the memory test. In this group it seemed that factors II and III could be identified with Wing's second factor. For the 3rd group no such factor could be identified but the same tests (4 and 5) were contrasted in a later factor. With the average group, tests 1 and 5 separated from the battery as in Wing's 3rd factor.

Shuter concluded that the results of the talented groups and the average group "suggest that the differences are of kind as well as of degree, though the talented groups may have a more highly evolved or developed ability".

Shuter gave some interesting results from her analysis of the two sex groups. She found that men did better in the pitch test, while women found the 5-7 tests easier, and the two groups were identical on test 4. In the men's group, the harmony test had the highest loading in factor I while the same test ranked 5th in the women's first factor. The loadings of tests 4,6, 7 on Factor I also differ in two groups. With the male group, the appreciation of phrasing and rhythm seems to play a more prominent part in their musical ability, while they lack the appreciation of intensity, which is much stronger in the case of the female group. She concluded that "such differences seem to accord quite well with the tentative explanation put forward by Wing of the rather better performances on his appreciation tests at the age of 14." The results also seem "to support his recommendations that the intellectual appeal of music should be stressed with boys over 14 whereas for girls more emphasis should be placed on the emotional and expressive aspects. If boys tend to be more extroverted in their approach to music, rhythm would seem more likely to appeal to them." (P.399).

In both groups Factor II is a bipolar factor. That obtained from the male group is reasonably comparable with Wing's, but in the women's group positive loadings were obtained from tests 1, 4 and 5. Shuter concluded that the "women tend to judge test 5 by general feeling of movement conveyed by suitable harmonics, rather than analytically." (P.400).

Factor III for the women's group was like Wing's 3rd factor but no comparable factor was obtained by men.

Shuter rotated the first 3 factors, but concluded that "Rotation would not appear to make the factor analysis of the Wing's tests more meaningful". As Wing himself pointed out (1941) "with the present tests this rotation is an extremely hazy business, for we cannot ...... assume that any one of the given tests is a pure test of a particular function in music". (1941 (A) P.279).

In a recent study by Beard (1965), Seashore's test of rhythm and Wing's Analysis of chords and pitch discrimination were given among other tests of visual perception and reasoning to English boys and girls aged about 15. Factor analysis by Principle Components was carried out for each group separately. One of the extracted factors for both groups was called "Recognition and Recall of Gestalten". The highest loadings of this factor were in tests of musical abilities but the interpretation of the factor suggested that it is not purely auditory but depends on " a more general ability to recall Gestalten after a short interval." (P.216).

Another recent study was that by Rainbow (1965) who investigated the constituents of musical ability through regression analysis in which the independent variables were: Seashore, Pitch, Tonal Memory and Rhythm; Drake's Memory test; other variables were academic intelligence, school achievement, sex, chronological age, musical achievement, musical training, home enrichment, interest in music, participation in music by relatives and socio-economic background. The criterion was the defined musical ability of the subjects as indicated by their teachers. His subjects were 91 students in grades 4-6, 112 in grades 7-8 and 88 in grades 9-12. Through this method Rainbow found that pitch discrimination, rhythmic sensitivity and musical memory are the predominant constituents of musical ability. His results also indicated that extra-musical variables are relevant to the discrimination of level of musical aptitude. These variables are (1) Interest in music, (2) home enrichment, and (3) socio-economic background.

In another study carried out also to determine the components of musical ability Henkin (1955) did not use formal tests but recorded the reactions of college students to recordings of music from different periods. After factorizing his data, he found evidence of two factors which he identified as melody and rhythm and possibly a third, namely, orchestral colour. These were described as factors of esthetic appreciation. A harmony factor was not identified possibly because the selection of records did not cover this aspect clearly.

To conclude this section; various factorial techniques have been applied to data from different test batteries of music and other non-music tests to discover fundamental and independent traits or factors in musical ability. However, it is well known that the factors obtained differ according to (a) the methods of factor analysis used (b) the nature of the tests and (c) the populations studied. Generally speaking, American factorists prefer to use Thurstone's methods of analysis, while in Britain Burt's methods are generally followed. We cannot conclude that the American school of factor analysis is completely "multi-dimensional" and the British school is "hierarchial" since both methods are used in the two countries.

In the major studies carried out using music tests which have been factorized by different techniques either a "common" factor, Drake 1939 or a "general" factor, Karlin (1941), Wing (1936-1941), McLeish (1950), Shuter (1964) has been obtained. In Drake's study the Spearman's tetrad difference technique was used. He obtained beside the common factor three other overlapping group factors. When Karlin (1941) re-analyzed Drake's data he obtained a general factor and three other factors. In this analysis, Karlin used the Centroid method. In his studies Wing (1941) used both Thurstone's method and secondly Burt's Weighted Summation method. In both cases he obtained a general factor. Re-analyzing the second factorial study by Hottelling's method of Principal component, Wing obtained the same results.

The most interesting results were those reported by Mcleish (1950) when he factorized the Seashore tests and the Wing tests. Though these tests are based on different theories, he identified a common factor of a "cognitive aspect of musical ability", which as he stated appeared in both sets of tests.

However, it is apparent that in Drake's words (1939) "even when a special attempt is made to measure isolated and independent abilities, it is seldom absolutely achieved". When the tests used tend to measure sensory abilities, they appear to be relatively more independent than tests based on musical material as in Karlin's (1942) researches. Hence the nature of factors depends considerably on the choice of the tests.

Though several other subsidiary factors of musical ability such as pitch, memory, rhythm, etc. have been claimed, almost the only consistent factors in several researches appear to be Wing's perceptual (i.e. pitch and memory) and aesthetic appreciation factors.

Chapter IV

The Present Investigation

The present investigation is undertaken in an attempt to measure the musical abilities of a sample of students of Arab-background taking music as a special subject. As have been stated above, although many studies have been carried out in the field of musical ability, exploring its nature, and following out different theories, little has been done to measure music ability with populations whose musical ability may be affected by the nature of their own music.

A second purpose of this study is to devise, if possible, a set of tests which could be used as a criterion for selection in the scheme of music education in Egypt.

The design of the present study will include:-

1. The field of research and hypotheses.
2. The tests.
3. The sample.
4. The experimental procedure.

1. Field of Research and Hypotheses

From reviewing previous studies regarding the nature of musical ability it seemed profitable to explore the following areas by means of music tests given to students of Arab-background. The major hypotheses of the research may be formulated as follows: that the structure of musical ability could be demonstrated in a sample of Egyptian school children.

I. <u>The Structure of Musical Ability</u>;

1. Does a battery of tests including sensory, perceptual, and appreciative tasks measure a unitary musical ability? The hypothesis is that the cognitive and appreciative aspects of musical ability may yield a unitary ability, such as would be exhibited by a general or common factor running through all the tests. The resulting factor is designated as a "general musical ability".

2. If the expected "general musical ability" failed to be identified, the alternative hypothesis is that the battery of musical tests measures different and independent abilities. These group factors are expected to run through tests which are homogeneous in regard with the process involved, e.g.

a. <u>Auditory sensory factors</u> in the tests of discrimination and estimation.

b. <u>Musical perception factor</u>: as measured by Wing's and Bentley's tests.

c. <u>Musical expressive and appreciative factors.</u>[1]

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[1] Tests of this aspect were included only in the studies of the adults groups.

II. The Relations of Musical ability to a number of variables will be investigated.

1. General intelligence;

Many researches on the relationship between musical ability and tests of "g" particularly those using sensory tests, have shown positive but rather low correlations. However, there is always likely to be the need for a certain degree of intelligence in order to understand and carry out the instructions.

Inaddition, the results may differ as the philosophy of devising test batteries differ. Mursell (1939) concluded that "in American studies where musical talent was generally measured by the Seashore method, very little relationship was reported between the two variables ... while in European studies where musical ability was measured by functional criteria, intelligence and musical ability showed a positive relationship". Thus in this study attention will be paid to the relation of "g" to both sensory (Seashore) "perceptive, (Wing and Bentley) and "appreciative (Oregon) tests.

2. Age:

The age factor needs careful control. Many studies dealing with it have led to conflicting results. Seashore (1919) expressed the opinion that the capacities measured by his tests mature quickly in very early childhood. But in his test manual there are 3 sets of norms for the different grades which, of course, differ in age. He justifies this by the introduction of two concepts - the physiological and the cognitive limits. Thus adult subjects are thought of as similar in physiological limits but more advanced cognitively. However Stanton and Koerth (1930) found marked differences between pre-adolescent, adolescent and post-adolescent groups, which obviously throws doubt on Seashore's view. They explain the discrepancy in Seashore's terms, i.e., the physical threshold cannot be identified before cognitive maturity is reached at 16+.

Wing and Bentley however expect increases with age since separate age norms are available for their batteries.

It is expected, in the present study that marked differences between junior and senior students will be shown.

3. <u>Musical Training</u> :

Seashore (1919), Stanton and Koerth (1930, 1933) claim that musical ability is uninfluenced by the amount of training of the subjects. Farnsworth (1931) pointed out that studies on the relationship between musical ability and amount of training are not decisive. Wing (1941) and Vidor (1931) consider that musicality can develop independently of training, at least in children up to 15. Vernon (1950) found that measures of training and musical knowledge correlate very highly with Oregon musical judgement scores and with any other tests based on musical material.

The problem here has two aspects:

(1) The relationship between musical ability tests and previous training, and (2) the relationship between these tests and criteria of success (achievement scores), i.e. the problem of validity.

4. <u>Spatial Factor:</u>

Some investigators have reported a relationship between musical ability and motor and spatial factors, and this will be studied in our adult groups.

5. <u>Interest in Music:</u>

Gebhard (1949) suggested a plausible theoretical basis for expecting a relationship between interest and aptitude factors. Yet when Wesley, Corey and Stewart (1950) attempted to compare parallel tests of abilities including Seashore's tests of Musical Talent with Kuder Preference measures of interest, they found the correlations of corresponding pairs of variables ~~(measures of interest)~~ to average .30. Similarly low correlation were found by Brogden (1952) and by Guilford et al (1954).

Burt (quoted by Wing, 1948) suggested that persons who are interested in music consider Seashore's tests meaningless and boring because of lack of a genuinely musical content.

The hypothesis to be tested is that the relationship between degree of interest in music (as self-rated) and musical ability tests depends on the degree of musical meaningfulness involved in the tests, with the sensory tests the least meaningful and the expressive tests the most meaningful.

6. Oriental Versus Western Music Preference

It was found by Fay and Middleton (1941) that those who preferred classical music made higher scores on Seashore's Pitch, Rhythm and Time tests than did those who preferred lighter classical music. This is an indication of the role of musical aptitudes in the development of musical preferences, for apparently the most "high brow" music does appeal more to those who are best endowed. The hypothesis relevant to the present study is rather whether the preference of either Oriental or Western music will show certain aptitude relationships, and how far there is a separation or overlapping of abilities concerned with Western and Oriental music.

7. Environmental Factors:

It is hypothesized that Family Musicality and encouragement of the subjects, musical activities and possibly socioeconomic status may influence test performance.

Hence information on such factors will be obtained by questionnaire.

2. <u>The Test Batteries:</u>

Tests of musical ability may be classified into two main types: (a) Tests which aim to measure innate capacities for the performance or appreciation of music. These have generally been devised by psychologists according to psychometric principles. (b) Tests which measure proficiency resulting from music education. These tests are devised more by those who are responsible for musical education and depend on their experience in this field.

Since this study is the first to be carried in Egypt, where no formal tests of music have been used before, it was important to try to choose tests to include every aspect of music as far as possible.

After reviewing the general ideas of other investigators and which shed some light on the nature of music tests and what they measure, it was decided to include some of the tests which have been used before and proved to be reliable and valid. Other new tests have been devised specially for the present investigation to include material which seemed to be essential to measure the musical abilities of oriental subjects, bearing in mind the nature of the music practiced by them and the standard they have acquired through their musical instruction in schools.

For this investigation two test batteries have been devised

1: The children's battery

2: The adult battery

Description of the tests included in each battery will be given separately.

1: <u>The Children's Battery of Tests</u>

This battery includes (a) tests which have been used before in other investigations and (b) new ones devised for this investigation. The following table shows those tests for catagory (a) and (b).

Table (33)

A			B		
Author	Test	No. Items	Author	Test	No. Items
Seashore C.E.	Pitch	50	SADEK A.	Rhythmic Identification	30
	Rhythm	30		Melody Identification	30
	Time	50		Interval Recognition (W)	30
	Tonal Memory	30		Interval Recognition (O)	10
Bentley A.	Pitch discrimin.	20		Questionnaire	
	Tonal Memory	10			
	Rhythmic Memory	10			
	Chord Analysis	20			
Cattell	IPAT Scale II	~~[illegible]~~			
	Series	12			
	Classifications	14			
	Matrices	12			
	Conditions	8			

From this table it is clear that there are some aspects of music which are covered by more than one test. As mentioned above, when selecting this battery it was kept in mind that as many tests as possible should be included in order to give a better choice of tests for a battery which would be useful in selecting students to specialize in music. Moreover an extensive battery will help to determine more fully the essential components of musical ability.

a: The Pitch Tests

Tests measuring pitch sensitivity may follow several different principles. There are three kinds of pitch tests devised by psychologists. One is based on absolute and relative pitch. A person who can name any note without any preparation, i.e. hearing a reference note such as a tonic for a certain scale, is said to possess absolute pitch. On the other hand, naming a note after hearing a reference note, is called relative pitch ability. Revesz (1953) mentioned different degrees of absolute pitch. He referred to those who can identify a note sounded to them by its correct letter name and those who can sing a certain note from memory. Both abilities can go together, but there are some who possess the first only. Absolute pitch is rather a special gift which is possessed by few persons, and with different degrees of accuracy. Those who can cover the whole musical range are very few and they are said to have "genuine absolute pitch". To cite Revesz "Genuine absolute pitch is a natural gift par excellence. It appears already in early youth and at once in a highly developed form. In musically gifted children one can find genuine absolute pitch as early as the third year."...(p.98).

Revesz also referred to "relative pitch" as an "intervalic sense", for in absolute pitch the "note is experienced and identified as a musical individuality, while with relative pitch the connexion between two notes is apprehended through its specific intervalic character." (P.107) Revesz opinion about relative pitch is that it is "an inherent gift, and can be developed by practice. It varies with the individual .... and is considered a safe criterion of musical aptitude. .... The lack of intervalic sense or failure to develop it, makes it almost impossible to understand music or respond to it aesthetically." (p.108). A third type of pitch sensitivity is the ability to recognize whether two notes which are very close together in pitch are identical and if not whether one is higher or lower than the other. Seashore, C. (1938) refers to this ability as "Pitch discrimination", which is considered "a measure of the capacity for using pitch in musical hearing and tone production." (p.55); it is needed by the singer or violin player who need to sing or play in tune. When discussing the factors of the musical mind, Seashore, (1919 p.7), referred to this ability under the factor called "musical sensitivity" which also include "senseof intensity, sense of time, and the sense of extensity." All these need fine discrimination, which differ in degree of accuracy from one individual to another.

This type of pitch discrimination ability can be tested by sounding two successive pure tones which are different in frequency. The subjects are asked to state whether the two tones are the same or different. Individuals differ in their ability to perceive and discriminate the difference. Lundin (1953) states that "an average individual" is able to discriminate differences in pitch between two tones "which are plus or minus three cycles". Thus if we sound the A, which is usually played as a reference in tuning orchestral instruments and which has a frequency of 435cps, and then drop it to 432 cps or rise to 438, the average individual can just perceive that it has changed. This difference limen will differ between one individual and another for any particular frequency and also differ for the same individual at various frequencies. Seashore also (1938) referred to the "average threshold for an unselected group of adults as about 3 cps at the level of international pitch, 435 cps, while a very sensitive ear can hear a small difference as 0.5cps or less i.e. less than 0.01 of a tone.

To be able to discriminate between two tonesis rather easier than to be able to distinguish the direction of the difference. However, the pitch tests which were selected for the children's experiment cover both these functions. It was decided to include only tests which measure the ability to discriminate fine pitch differences because this is considered to be more important to the student of music than sense of absolute pitch. An additional test involving relative pitch was devised for this investigation and will be discussed later.

<u>The Pitch Discrimination Tests</u>

a: The Seashore Pitch discrimination.

In the 1960 revision, this test is presented with the other five Seashore tests on a single 33⅓ rpm long playing record which replaces the earlier 78 rpm or 33⅓ rpm record has been used before. It consists of 50 pairs of pure tones which are sounded successively. In each pair the subject has to determine whether the second tone is higher or lower in pitch than the first. "The stimuli were derived from a beat - frequency oscillator through a circuit producing pure tones lacking in harmonics and overtones. The tones are at about 500 cycles and have a duration of .6 second each." By using this stimulus, the revised tests overcome the weakness of the original pitch test which was based on tuning forks. The test items gradually move from easy to difficult as the frequency between the tones is reduced. Frequency differences between the tones in the pairs are as follows:-

Item Numbers	Differences in Cycles
1-5	17
6-12	12
13-22	8
23-32	5
33-40	4
41-45	3
46-50	2

b: The Bentley Pitch discrimination test:-

The pitch test, together with the other tests of the battery, are represented on a single $33\frac{1}{3}$ rpm record. The test consists of 20 pairs of pure tones which are sounded successively, and each tone is sustained for one second. There is a time gap of six seconds between the pairs. Subjects are asked to state if the second sound of each pair is the same as the first (answer: "S") or if it moves up or down (answer 'U' or 'D'). The reference tone throughout is A = 440 c.p.s. and the stimuli were derived from a "specially calibrated sine-wave oscillator" which secured the production of pure tones. In this test, the biggest difference to be judged by the subjects is the semitone and this gradually decreases to a difference of 3 c.p.s. Bentley states that in the earlier versions of this test differences of 2 c.p.s. and 1 c.p.s. had been included. When the scores on these versions were analysed, it was found that the answers for the items involving such small differences were "unreliable and to some extent the result of guessing" Bentley (1966 p.59). He concluded that this may be due to (a) "subjective difficulties intrinsic in making judgements upon such small pitch differences and (b) it may be due to the physical circumstances of recording and playing back the sounds through a loudspeaker" ... which may affect the sound heard and can suggest "a slight change of pitch" (p.59). It was therefore decided to include only differences of 3 c.p.s. upwards since these appeared to be most reliable for group-testing in school class-rooms.

The following table shows the pitch differences and theirdirection in each item of the test. (table taken from Bentley 1966 p.76).

Table (34)

Item	Direction of Movement	Differences as a Fraction of a Semitone	Differences in c.p.s.	First Sound c.p.s	Second Sound c.p.s
1	Down	1	26	440	414
2	Up	1	26	440	466
3	Up	$\frac{3}{4}$	18	440	458
4	Down	$\frac{3}{4}$	18	440	422
5	Up	$\frac{1}{2}$	12	440	452
6	Down	$\frac{1}{2}$	12	440	428
7	Down	C.5/13	10	440	430
8	Up	C.5/13	10	440	450
9	Same	-	-	440	440
10	Up	C.4/13	8	440	448
11	Down	C.4/13	8	440	432
12	Up	C.3/13	6	440	446
13	Down	C.3/13	6	440	434
14	Down	C.5/26	5	440	435
15	Up	C.5/26	5	440	445
16	Same	-	-	440	440
17	Up	C.2/13	4	440	444
18	Down	C.2/13	4	440	436
19	Down	C.3/26	3	440	437
20	Up	C.3/26	3	440	443

Comparison between the two pitch discrimination tests

In general the two tests seem to measure the ability to detect fine pitch differences. But there are important differences between them.

1. The biggest pitch differences is not the same. With Seashore it is 17 cp.s. while with Bentley it is 26 c.p.s.

2. What is required from the subjects in the two tests are different. In the Seashore test the subject has to state only if the second tone is higher or lower than the first. The subject is told that there is always a difference between the two tones, while in the Bentley

test there are some (2) "same" answers, "Up" answers and "Down" answers which make the test a little more difficult. They "suggest something static where "up" and "down" suggest pitch movement". (Bentley 1963 p.174).

3. Seashore did not provide examples to his test, while Bentley did.

4. The tones are sustained for longer periods in the Bentley tests than the Seashore test.

2: <u>The Rhythm Tests:-</u>

One of the most important characteristic of all Arabic music is its rhythm. From a very early age, rhythm is practiced in the children games in Egypt. Seashore (1938 p.145) discusses the basic factors in the capacity for rhythm namely

(a) the rhythmic impulse to action,

(b) the cognitive capacity, and

(c) the motor capacity

By (a) he meant the "instinctive impulse to express rhythmic grouping" in which children differ markedly.

By (b) he meant the sense of rhythm which he defines is "the capacity for hearing and recalling rhythmic patterns with precision in time (1938, p.146). He referred to this capacity under the factor called "complex forms of appreciation" together with the "sense of timbre", the "sense of consonance" and the "sense of volume" (1919, p7). He claims that this capacity can be measured accurately by "employing a graded series of musical patterns from simplest to very complex and determining what is the largest pattern an individual can hear and identify correctly". (p.146, 1938).

By (c) he refers to the capacity for "expressing rhythmic patterns in music with fine discriminative action.... this capacity can be measured before musical education ... either by imitating standard patterns of rhythm or by setting up his own patterns in metronomic time" (p. 146, 1938).

What concerns us here, is (b) which is "the capacity for hearing and recalling rhythmic patterns", since this capacity is very important for the music student.

The two Rhythm tests in this battery are those of Seashore and Bentley, and a third test bearing on identification of rhythmic patterns is described later.

1. <u>The Seashore Rhythm Test</u>:-

In the test, there are thirty pairs of rhythmic patterns each containing a series of rhythmic clicks. The subject is to indicate whether the two patterns in each pair are the "same" or "different". The stimuli used are not tonal, since Seashore believes such isolation helps to measure the pure sense of rhythm. Hence the source of the stimuli was a beat-frequency oscillator set at 500 cycles. Tempo is constant at the rate of 92 quarter notes per minute. The first ten items contain patterns of 5 notes in $\frac{2}{4}$ time; the next ten items contain patterns of 6 notes in $\frac{3}{4}$ time, and the last ten, patterns of 7 notes in $\frac{4}{4}$ time.

2. The Bentley Rhythm Test

This test "consists of ten items of paired comparisons, each half of each item being a four pulse rhythmic figure. The speed of playing is about 72 pulses to the minute. Between the cessation of the last sound of an item and the announcement of the number of the next item six seconds elapse. The recordings were made from a pipe organ, using eight-foot small diapason and two-foot fifteenth stops".

Subjects are asked to state whether the second half of each item is the "same" as the first, or, if "different", to state the pulse on which the change is made. Thus five possible answers are available : S,1,2,3, or 4. Eight items contain a change in the second half. Two items do not, and the second half of each of these two items is a re-recording of the first half, since it is virtually impossible to play the same pattern twice in exactly the same way in respect of absolute note-lenghts". (Bentley p. 61, 1963).

The Memory Tests

Memory may be considered one of the most important factors which affect the person's musical activities. Even the simplest tests usually involve comparison of a stimulus with another heard previously, which therefore has to be remembered. At a higher level, in musical examination a performer who can perform a sonata from memory may be rated higher than another who played the same sonata with the same skill from the printed music. Hence most batteries of music tests include a memory test, though these vary considerably in types of items and therefore probably do not measure the same ability.

In this battery two memory tests were included.

a: The Seashore Tonal Memory Test:-

The Seashore Tonal Memeory test appears to be one of the best in the battery, and has generally given good reliability and validity coefficients in previous investigations.

This test consists of 30 pairs of tonal sequences, 10 with three tones, 10 with 4 and ten with 5 tones each. In each pair one note is different in the two sequences, and the subject has to identify which note it is by number. In each of the three groups, the items are arranged approxiamately according to difficulty. A Hammond organ was used as the stimulus source. The pitch range lies within 1½ octaves from middle C upwards. Tempo was carefully controlled and intensity is essentially constant. (Manual 1960)

The test is also recorded on a 33⅓ r.p.m. record. This was taped without the English instructions to avoid confusion. The instructions were translated into Arabic and followed by the Examiner, who made sure that every subject understood what is required in this test. Since no examples are provided in the record, the examiner gave illustrative examples on the piano.

The Bentley Tonal Memory Test:-

As in the Seashore Tonal Memory Test, rhythmic variations are excluded in the Bentley test of Tonal Memory, i.e. all the tones are of equal length. The test consists of 10 items of paired comparisons, each half of each item being a five-note tune. In the second half, one note is always changed either by a whole-tone or a semi-tone up or down. The pitch range is restricted to sounds within the easy vocal range of young children, from note D below the bottom line of the treble clef to note A a perfect fifth above. The speed of playing is about 120 notes to the minute. There are five changes of a whole tone, and five changes of a semi-tone, which are randomly distributed. The items were played on a pipe organ on eight-foot and four-foot flute stops.

In the instructions, it was stated that some items will be same, and others/are changed. The subjects were asked to state if the second playing of each pair is the same, or, if there is a change, to state the position of the altered note. "None of the items is, in fact the "same", but subjects who do not recognize a difference should have the opportunity of stating this". (Bentley 1963 p.61)

The two tonal memory tests seems to be very much the same except in (a) the number of items;

(b) the length of the items (3-5 in the first and 5 for all items in the second); and

(c) No examples were provided by Seashore for his test which, like the other Bentley tests, examples are given.

(d) The Bentley test items are more nearer to musical phrases while Seashore's are mainly atonal.

<u>The Time Test:-</u>

Music is an art in which time plays a crucial role. For example rhythm depends upon the time relationship between successive notes.

Seashore (1938) discusses the nature of the sense of time and distinguishes two aspects: (a) that concerned with fine discrimination and (b) that concerned with judging the flow of time over longer periods such as seconds, minutes or days.

In discussing the "factors of the musical Mind", Seashore (1919) lists this ability under the factor called "Musical Sensitivity" and argues that it " is basic for all perception of rhythm and for rhythmic action. A limitation in this capacity for hearing time sets a corresponding limitation upon feeling, thought and action". (1919 p. 9).

Wing criticises the Seashore method of measuring the sense of time, since the material used in his test "deals only with mere noise and not tones, which are after all the basis of all music"... He argues that in a musical situation time sensitivity does not consist in comparisons with the note just played, but depends "on the dynamic rhythmic progression of the melody- especially in relation to movement towards a good climax". (Wing 1948 p.11)

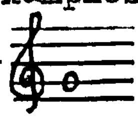
Although Wing's argument seems to be true of rhythmic production in Western music, Seashore's idea may have more application to the practice of rhythm in Arabic music. There are some situations where rhythm is practiced alone and the skill of the performer depends on his sense of time and the way he can fill a gap of time with as many small divisions of the beat as possible. So if he cannot judge fine time relations, he probably cannot produce the complicated rhythmic patterns required in Arabic music. Hence it was decided to include this test in the battery.

The Seashore Time Test:-

The test consists of 50 pairs of tones of different durations. The subject has to determine whether the second tone is longer or shorter than the first. The source for the stimuli was a beat frequency passing through a circuit producing pure tones lacking in harmonics and over-tones. The duration of the tones was controlled automatically by a tape timing device which had been prepared with a predetermined schedule of time intervals. The frequency of the tones was held constant at 440 cycles. Differences in duration between the tones in pairs are as follows:-

Item numbers.	Differences in Sec.
1-5	.30
6-10	.20
11-20	.15
21-30	.125
31-40	.10
41-45	.075
46-50	.05

As can be seen from the above table, the differences between ~~each~~ the two tones decrease gradually. The instructions made it clear that there is always a difference and that the subjects have to state whether the second tone is longer or shorter than the first.

Some examples were demonstrated on the piano using the note G  as the stimulus and sustaining it for different time intervals.

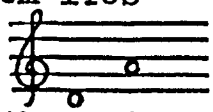
The test proper started when each subject understood exactly what was required.

Chord. Analysis.

Music is an art which depends on simple relationships between successive tones which form a certain interval, or on complex relations which exist when several notes are played together followed by others (chords and their resolutions). The ability to detect the relationship or interval between two notes may indicate the ability to deal with complex relationships.

In this battery two tests were included to measure this ability, the first one by Bentley and the second a newly constructed test.

A: The Bentley Chord Analysis Test.

The test consists of twenty items of two, three, and four-note chords. All the notes of every item lies within the vocal range of young children i.e. 
Each chord is sounded for three seconds, and there is a gap of six seconds before the next item. The chords were played on an eight-foot open diapason stop which secured the production of clear sounds. The subjects are asked to state the number of sounds they hear in each chord. There are 10 two-note chords, eight three-note chords and 2 four-note chords.

The examples provided by Bentley were used to illustrate the requirements of the test and these examples were repeated when necessary.

B: The New Tests.

1. The Interval Recognition Test

In musical examinations, a common aural test is to sound either two notes or two intervals and to ask the candidate if they are the same or different.

The idea of this test may be considered a half-way between the ability to state a difference between two single notes and the ability to analyse a chord by stating the number of notes or to state whether two chords (more than 2 notes) are the same or different.

The new test consists of two parts:-

Part (a) This part consists of 30 pairs of intervals which were played successively on the piano using the different registers of sounds i.e. upper, middle, and lower registers, but each pair should be in the same register. The subject has to state whether the two intervals are the same or different. The "different" items occured when a note from the second interval moves, whole tone or a semi-tone either up-ward or down-ward. The notes of each interval are played successively with a gap of two seconds between the members of a pair, and five seconds between one item and the next. Three practice items were given before the test.

Part (b) In this part there are ten items, produced on the violin. They are similar to those in Part (a), but quarter-tones are used, hence this part is considered to be more difficult generally because it needs finer discrimination.

The full musical script of the test will be found in the Appendix.

Tests which tend to measure learned behaviours are also included in this battery, namely

(a) Rhythmic Identification

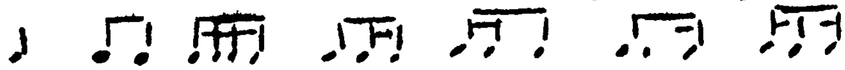
(b) Melody Identification.

These tests depend not only on musical aptitude and interest, but also on whether a student benefited from musical instruction, following a certain curriculum for several years.

The idea underlying these two tests was that the detection of a certain note in a melody, or a certain rhythmic pattern in a sequence, would require some degree of co-ordination between the visual image and aural acuity in both sight singing and the reproduction of rhythmic patterns. In these two tests the subject has to compare an auditory pattern as sounded once with a visual one which is printed on the answer sheet and to decide if they are the same or different. In the previous investigations reviewed above, other tests having the same idea have been included in several batteries. But each test had been devised with a particular population in mind, and referring to a particular standard of achievement in music.

The Identification Tests

A: Rhythmic Indentification I

This test was devised by the writer for the purpose of the present investigation. It consists of 30 items, which are all in $\frac{2}{4}$ time signature. Each item consists of 2 bars and the rhythmic patterns used are  and  . Only one sound is altered in each item or none. The items are graded from very easy to moderately difficult.

In this test, the subject is asked to compare a tapped sound pattern with a printed one on his answer sheet and to decide if they are similar or different. If the two patterns are identical, the subject has to mark (✓) opposite to the written patterns, and if different, he has to circle the pulse or the beat where alteration has occured.[1]

The speed of the items was considered as ♪ = 60. An interval of six pulses was left between the items to allow for writing the answers. Four items were given as practice items for this test.

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(1) No same items are included.

B: The Melody Identification Test:

This test is similar to the Farnum Music Notation test, but it is confined to detecting of melody only. The subjects have to compare short melodic phrases which are played on the piano once by the examiner, with those printed on the answer sheet. They are asked to indicate if the two phrases are identical or different. If "similar" they have to tick (✓) if "different" (X).

In this test there are 30 items, each item consists of a two-bar melody. The first 10 items are 3 note melodies, the items from 11-20 are 4 note melodies, and the last ten items are 5 to 7 note melodies. The melodies, are simple, and no intervals exceeding the fifth are used. Where a change in the melodic line occurs it consists either of repeating a note or raising or lowering by a whole tone or a semi-tone.

The items were played with a moderate speed allowing a 5 pulse interval for writing down the answers.

A musical script of the tests is given in the appendix.

Intelligence Tests

The relation between General intelligence and musical abilities was discussed when reviewing the previous invetigations. To determine whether musical abilities are related to general intelligence or not, the Cattell (IPAT) Culture Fair Scale II, Form A was included in this battery.

This test consists of 46 items divided into 4 sub-tests. The following table shows these tests, numbers of items, and the time allotted.

Table (35)

S. No	Test	No. of Items	Time Allotted
1	Series	12	3 mins.
2	Classifications	14	4 mins.
3	Matrices	12	3 mins.
4	Conditions (Topology)	8	$2\frac{1}{2}$ mins.

In the first test (Series) the subject has to choose one out of 5 drawings which should complete a set of these drawings which follow a systematic order.

In the second test (Classifications), the subjects are presented with fourteen sets of 5 drawings. They have to choose two in each set which are different in some way from all the other three.

In the third test (Matrices) the subject has to fill a fourth blank square by choosing one of five drawings.

Test 4 (Conditions), in this test the subjects are presented with a drawing in which a "dot" is put in a certain position, and five other drawings. The subject is required to find one of these five drawings in which he can put the "dot" in a position which corresponds to that presented in the "model" drawing.

There are 3, 2, 3, and 3 practice items for the four tests respectively. The instructions are not printed in the answer sheets, but they are explained orally. A copy of the test is given in the appendix.

3: The Subjects

In Egypt, music has a part in the curriculum at all stages except at the University level.

In all schools, the music teacher is required to follow a suggested curriculum provided by the Ministry of Education. The progress of the pupils, especially in the first two stages of education (primary 6-12 and preparatory 12-15) and their ability to read and write music varies considerably according to the capacity of the teacher to deal effectively with musical activities.

In the primary stage, the curriculum includes singing in unison, rhythmic exercises expressed either by clapping hands or playing percussion instruments. Also musical games are included which are usually accompanied by children's songs. The children who show special capacity and talent in musical activities are reported to the music department of the Ministry of Education.

At the begining of the preparatory stage, the first selection for musically talented children occurs.

This selection is done by music Inspectors from the Ministry of Education. The criterion for selection is that the child should perform satisfactorily on some preliminary tests as follows:-

1. Rhythm : to be able to clap the beat according to the speed of music played by the examiner.

2. Vocal Ability: the pupil is asked to sing different notes which are being sounded by the examiner once.

3. Pitch Discrimination: to be able to state if the second note of a pair is higher or lower. No fine pitch discrimination is required.

After selection, the child joins a preparatory school in which music is a compulsory subject and is introduced to instrumental playing, either the piano or the violin.

A: Subjects from preparatory schools

The subjects were selected from three preparatory schools, one in Cairo for girls (Sch. I) and two in Alexandria one for girls (Sch. II), and the other for boys (Sch. III).

The following table shows the number of subjects from each school, the instrument played and the range of ages.

Table (36)

	Sch I			Sch II			Sch III		
No. of Subjects Range of age	31 12+to15+			41 12+to15+			39 12+to15+		
Instrument Played	Gr.1	Gr.2	Gr.3	Gr.1	Gr.2	Gr.3	Gr.1	Gr.2	Gr.3
Piano Violin	19 3	3 0	5 1	12 5	7 2	10 3	9 6	9 7	3 5
Total of Subjects in Each Grade.	22	3	6	17	9	13	15	16	8

B: Subjects From the National Conservatory.

The National Conservatory of Music, Cairo, was established in 1958. Its establishment was due to the need for skilled performers who had followed an extended course combining music training with a general system of education, i.e. primary stage 6-12, preparatory stage 12+ to 15+, secondary stage 15+ to 18+ and university stage 18+. In both primary and preparatory stages, the students go normally to their usual schools and attend the Conservatory on certain days for music instruction including music theory, sight singing, and performing. The selection of the students for this course occurs earlier than that of the general preparatory schools, i.e. in the primary stage at 9+. Each year, the conservatory announces that a certain number of musically talented children are needed to carry on with special music education. Children from different primary schools may apply. The criterion for selection is that the child should obtain a certain percentage of marks in different tests which measure his general musical abilities such as pitch discrimination, rhythmic ability and vocal ability. Subjects who are accepted in the N.C. are usually better than those who carry on special music education in the general preparatory schools.

For the present investigation 74 children were chosen from the different grades (A,B,C,1,2, and 3). Subjects in grades A,B and C are those in the primary stage, while those in grades 1,2 and 3 are in the preparatory stage. Special attention was given to chosing siblings when possible.

The following table shows the distribution of sex, grades, and instruments.

Table (37)

Number of Subjects	Sex	Age Range	Grade	No. of Subjects in different grades	Type of Instruments Piano	Violin
29	Boys	9+to15+	A	3	3	0
			B	8	4	4
			C	7	5	2
			1	8	3	5
			2	1	0	1
			3	2	0	2
45	Girls	9+to15+	A	4	4	0
			B	10	7	3
			C	6	5	1
			1	4	4	0
			2	6	5	1
			3	15	8	7
N=74				74	48	26

In this sample of 74 the following sets of siblings were found:-

1 set of 2 brothers,
1 set of 3 sisters,
3 sets of 2 sisters,
5 sets of 1 brother and 1 sister,
1 set of 1 brother and 3 sisters,
and,1 set of 1 brother and 2 sisters.

These cases will be treated separately and as members of the whole group.

4: <u>Experimental Procedure</u>

The experiment was carried out in spring 1967. Testing had to be conducted so as to suit the convenience of the different schools. To each of the three general preparatory schools and the National Conservatory, a visit was made to discuss with the headmaster of the school the aim of this investigation and the suitable time for testing. Suggestions were given by the writer regarding the choice of the room which would be suitable for the examination procedure. A medium sized class-room was chosen in each school, which was comparatively quiet and far from any traffic noise. A piano in good condition, which was tuned for the purpose of the testing, was placed in the room. As the tape-recorder was used in some of the tests, it was necessary that a plug with the correct voltage was in the room.

During the visit also, the time table for the testing procedure was fixed which was 90 minutes on two succesive days in each school. These periods were divided into two 45 minute periods with 15 minutes for rest. An appointment was also fixed before these two days to see the testees for a 45 minute session, for a pilot experiment.

<u>The Pilot Experiment</u>:

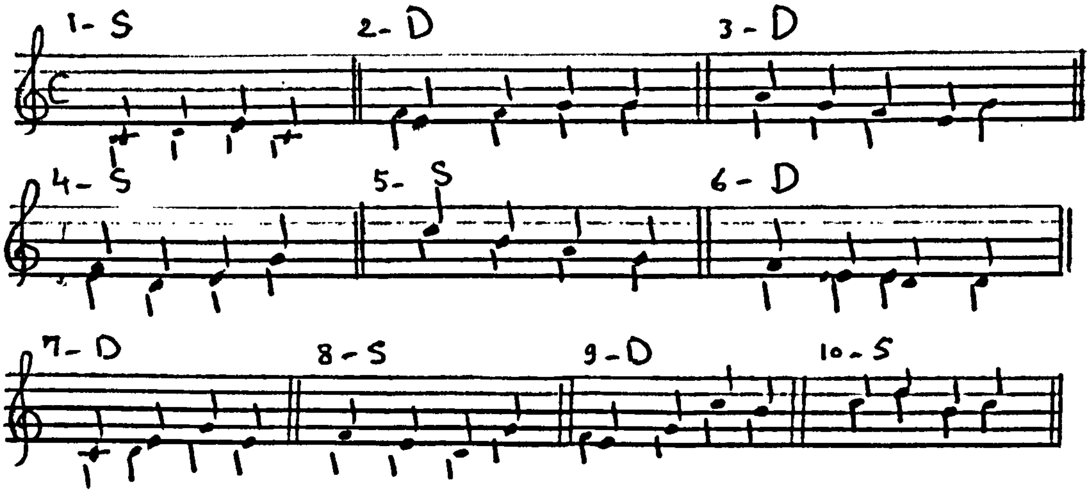
The aim of this pilot experiment was to introduce the new ideas of the tests used in the battery. Attention was drawn to the importance of the children's co-operation and of independent responses to the tests. Five 5 to 10 item tests were carried out as follows:-

I. <u>Pitch discrimination</u>: In this test, the aim was to illustrate to the children, what is meant by a note is "higher" or "lower" than another note which was sounded immediately before (reference note). The test was given at the piano, and the child has to write his responses on an answer form prepared for this pilot experiment. The test was as follows:-

It will be noticed that this test is very easy as compared with Seashore's or Bentley's pitch tests, because no fine pitch discrimination is required: a semi-tone is the smallest pitch difference involved. As mentioned before, the aim of this test was only to introduce to the children to what is meant by "high" and "low", which are the two terms used in the Seashore Test and to "Up" and "Down" which are the two terms used in Bentley's Test together with "same". However, when the test was corrected, the results showed that the children could understand and differentiate between the terms, as their mean scores exceeded 7 out of 10 in all the schools.

2: Memory Test: The idea of — testing the child's memory ability as introduced in the test battery is new. In all the selection tests, memory is measured together with other components. Thus asking a child to sing a tune after being sounded once by the examiner measures (a) his vocal ability i.e. to see whether he can produce different notes normally or a mono-tone and (b) his memory or his ability to remember a tune whatever its length. A memory test adapted for group testing purposes would ask the child to state whether two figures or phrases sounded successively are the same or different. Another form, which is more specific

and, which reduces the chances of guessing, is to state which note has been altered in the second playing.
The test devised for the pilot experiment were also very easy, asking the subject to state whether two 4-note melodies, played successively, are the same or different.
The pilot memory test was as follows



When the test was corrected, it was found that the test, although new in idea, was not very difficult as the mean score for the general preparatory schools was over 5.00 and that for the N.C. children was over 6:00. In this test, it was decided that the pilot tests should be as simple as possible to serve as a general illustration of what was going to happen in the general test battery.

3: <u>The Chord Analysis Test:</u> The idea of this test is absolutely new to the students who study music, especially at the early stages in music education. No chord analysis tests are used in the selection of music students in Egypt. The decision to include such a test in the battery was made to see how far a student who studies music and who ia already acquainted with oriental music which is non-harmonic, can state the number of notes that are sounded together. The Egyptian student is only acquainted with chords if he studies a piece of music on the piano which involves harmony. Through this means he is introduced to the usage of chords and to hearing them when sounded on the piano. For those who study the violon it is almost new, because even when they take part in group playing at the school-bands, this mostly consists of two part melodies. Moreover he will probably not listen much to the other students while participating until he reaches the advanced stages and has mastered the techniques of the instrument, after which he should have the chance of musical interpretation and hearing the others.

The pilot test was given to the children after explaining what/meant by "chord". It included 10 items. The student has to state whether one, two, or three notes are sounded together. The test is as follows:

The test proved to be on the difficult side since the mean scores obtained by the two children's groups (General preparatory schools and the N.C.) was lower than 50% i.e. lower than 5 marks out of 10. This gives the impression that the Bentley Chord Analysis test will be the only difficult test in this battery.

4: <u>The Melody Identification Test</u>:

Five items were devised for this test, similar to those described in discussing the test battery. The five items were written on the black-board and the examiner (the present writer) played them on the piano at a very moderate speed. The subjects have to state whether the phrase played is identical with that written on the black-board. The five items were only single phrases in which various alterations were introduced as follows:

It may be noticed that in this test, no alteration occured in the rhythmic patterns. Alteration occured by moving a note higher or lower by one tone or a semi-tone.

The children enjoyed this test as they were told that they were acting the teacher's role in spotting "my" mistakes when playing the example on the piano. They were told to write down the number of notes altered, or where "I have made a mistake" or if not sure "just put X" and to put (✓) when no mistakes occur. The test proved to be easy since the subjects scored above 3. The only example in which a wrong response was often given was to the 4th. version, where the alteration occured in the first note. However no prediction as to whether the serial position of the alteration affects the responses is possible since no example was given where an alteration occured in the last note.

5: <u>The Rhythmic Identification Test</u>:

The principle of this test is similar to that of the Melody Identification test. The examples included five items in $\frac{4}{4}$ time (one bar), which were written on the black-board and the examiner clapped them at a moderate speed. Again only one $\frac{4}{4}$ bar acted as the stimulus, and the performance was either similar or different.

The test is as follows

As written on the black-board

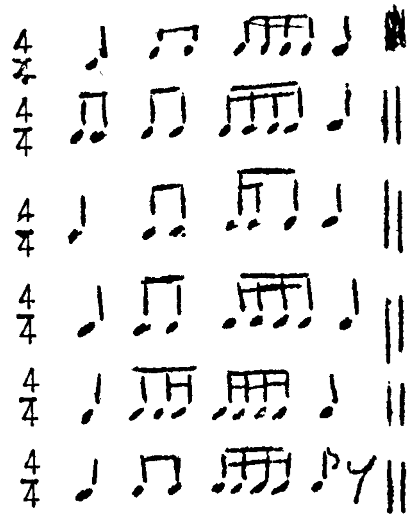
1st Item

2nd Item

3rd Item

4th Item

5th Item



In this test the subjects have to circle the pulse in which an alteration occured(described as a mistake made by the tester in clapping it) or to put (✓) when clapped right.

Again this test proved to be easy since most of the subjects obtained more than 3 in a five item test.

After a week's gap, the experiment proper was carried out in each school on two successive days. On each day a certain number of tests were done as the whole battery was divided into two groups as follows:

Table (38)

First Day	Second Day
Group I	Group 2
A: Bentley's Musical Ability tests 1.Pitch Discrimination 2.Tonal Memory 3.Rhythmic Memory 4.Chord Analysis B: Sadek: Rhythmic Identification C:Cattell: IPAT Scale II	A: Seashore Measures of Musical Talent 1.Pitch Discrimination 2.Rhythm 3.Time 4.Tonal Memory B Sadek: Interval Recognition C: Sadek: Melody Identification

Each group of tests was given in one session with a ten minute break after the Bentley tests in the first group and the Seashore testsin the second group. Short breaks of 2-5 minutes were given between subtests of the Seashore, especially after the Pitch and the Time tests because of their length.

The instructions for each test were read clearly by the examiner, and a period of time was allowed for the subjects to read these from the answer sheets and to answer any questions raised by the subjects. It was made clear, after illustrating what was required by giving either the author's examples or examples prepared by the examiner, that no questions were allowed once the test had started.

During the testing period, each student sat at a desk corresponding to the serial number he had been given.

All the answer-sheets were put on the desks in order and were collected at the end of the session.

During the testing periods, two proctors co-operated with the school music teacher and the writer.

<u>The apparatus used</u>:

Both the Seashore tests and the Bentley tests were recorded beforehand on tape to avoid any accidents such as breakage of the record. In taping these tests, any English instructions were omitted. Examples of the Bentley tests were used but explained in Arabic.

The Rhythmic Identification test was clapped by the examiner, since when trying to record it, the sound effects of the room could not be eliminated or avoided, and this made the recording of the test impossible.

The Melody Identification test was played on the piano for the same reason mentioned above. The first thirty items of the Interval recognition test were played on the piano, but the ten items (oriental section) were played on the violin by a teacher from the Higher Institute of Music who co-operated throughout the experiment.

In the following pages, instructions for the different tests are given together with the frequency distribution tables for each test, and histograms illustrating the distribution of the raw scores obtained by each group separately. In the case of new tests a musical-script is provided.

The Arabic translations of all instructions are given in Appendix II.

A: Seashore Tests.

1. Pitch Discrimination Test. (Instructions).
(As presented in the 1960 Manual).

"You will hear two tones one right after the other. The second tone is either higher or lower in pitch than the first. Find the section of the answer sheet lebelled "Pitch". You are to make a mark under the letter H on the answer sheet if the second tone is higher than the first; but mark under L if the second tone is lower. Answer every time; if you are not sure, guess". Here are some examples to illustrate what is required.

Examples Devised By the Writer

The following table shows the frequency distribution, mean, and standard deviations obtained by the children's groups.

Table (39)

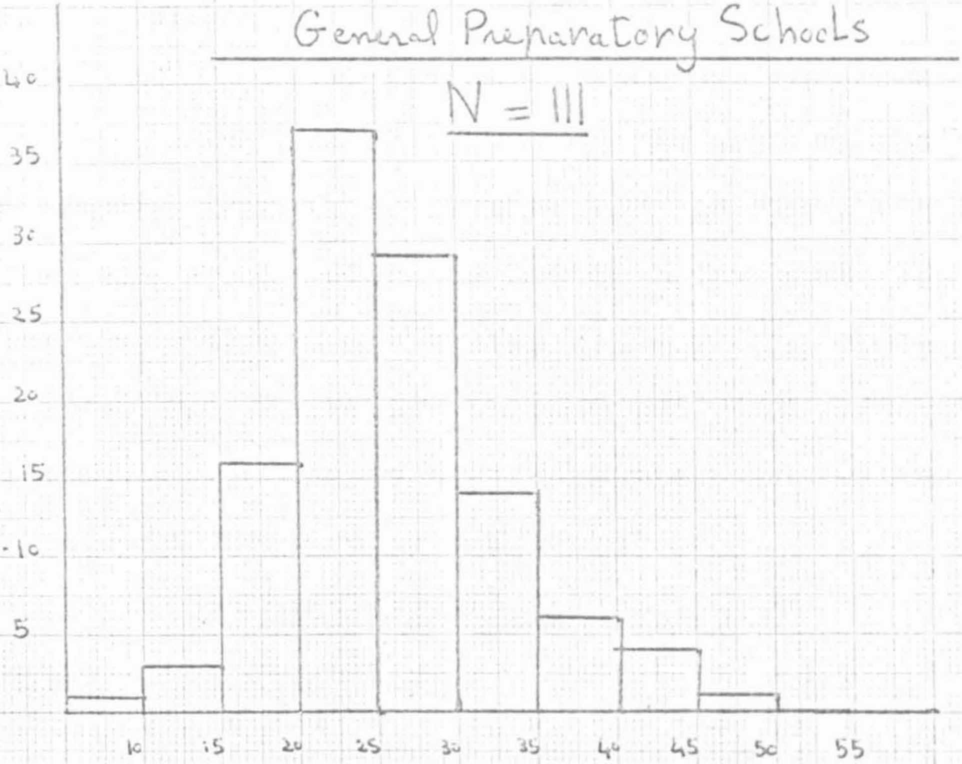
Seashore Pitch Test.

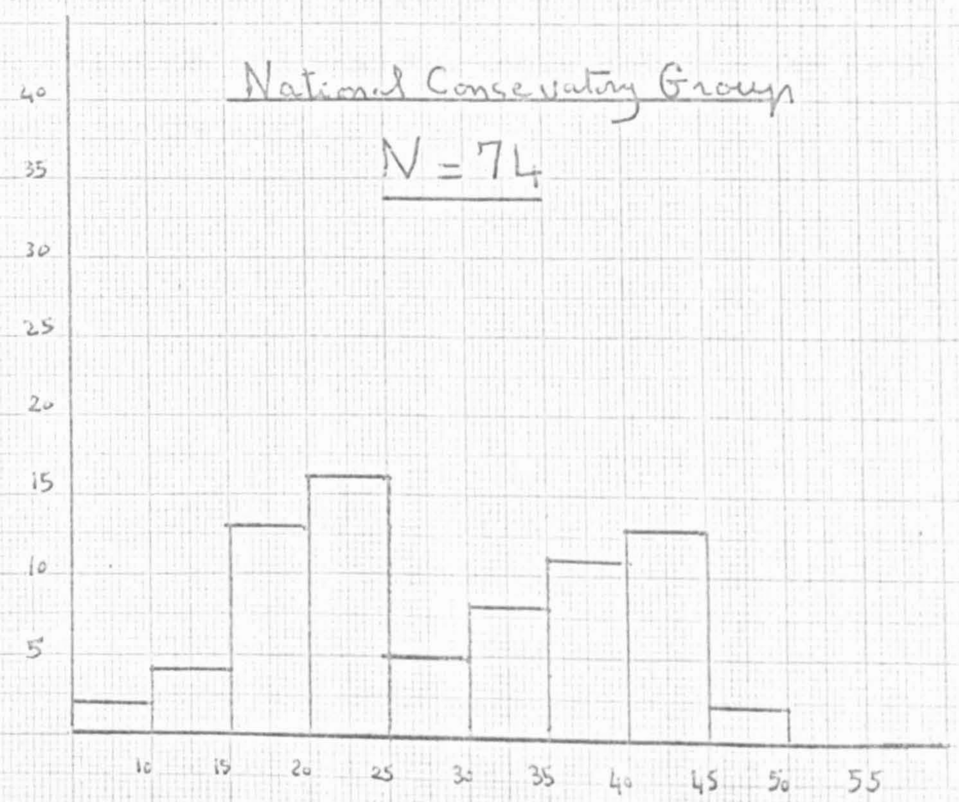
Interval	General Preparatory Schools			National Conservatory	
	Sch. I Girls	Sch. 2 Girls	Sch. 3 Boys	Girls	Boys
46-50		1		1	1
41-45	1	1	2	8	5
36-40	1	1	4	7	4
31-35	7	1	6	4	4
26-30	8	11	10	4	1
21-25	11	14	12	9	7
16-20	3	10	3	8	5
11-15		1	2	2	2
6-10		1		2	
N	31	41	39	45	29
Mean	26.61	24.05	27.92	28.98	29.45
S.D.	6.01	7.39	7.11	10.78	10.22
Min. Max	16-41	8-48	15-41	9-46	12-46

A histogram presenting the frequency distribution of each of the two main groups is shown in Fig. 1. It will be seen that the lowest mean score obtained is 24.05 in the General preparatory school 2. The highest mean score obtained from the Boys group in the N.C. It may also be noticed that in both groups, the boys have done better than girls. Differences between the main groups and sex differences will be discussed later.

Figure (1)

Seashore Pitch Test





Instructions for the Rhythm Test

"You will hear two rhythmic patterns, one right after the other. The second is either the same as the first or different from it. If they are the same, you should blacken the space under the letter S for that item.... If the two patterns are different, mark the space under the letter D. There are only 30 pairs of patterns in this test. You are to decide whether the rhythm in each pair is the same or different".

Examples devised by the Writer

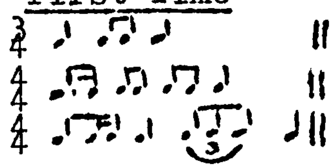
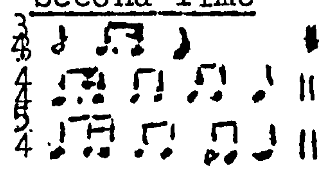
Example	First Time	Second Time
1		
2		
3		

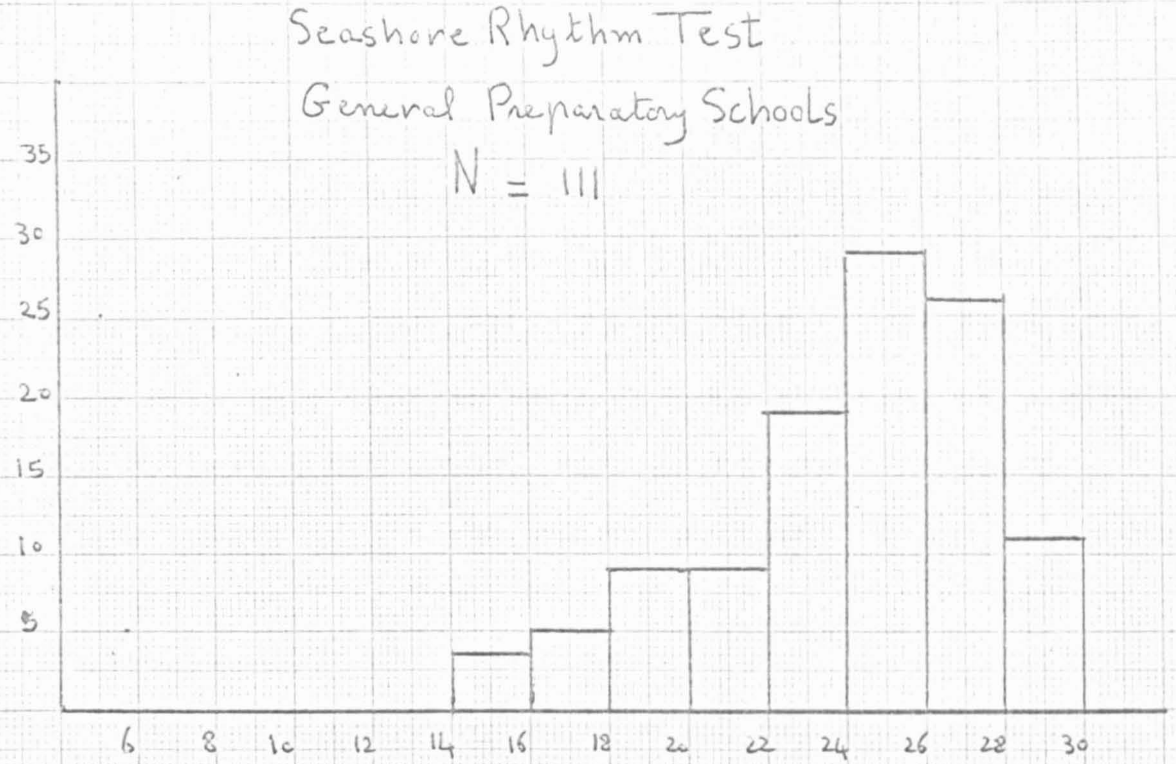
Table (40) shows the frequency distribution, mean, S.D., minimum and maximum score obtained by each school separately.

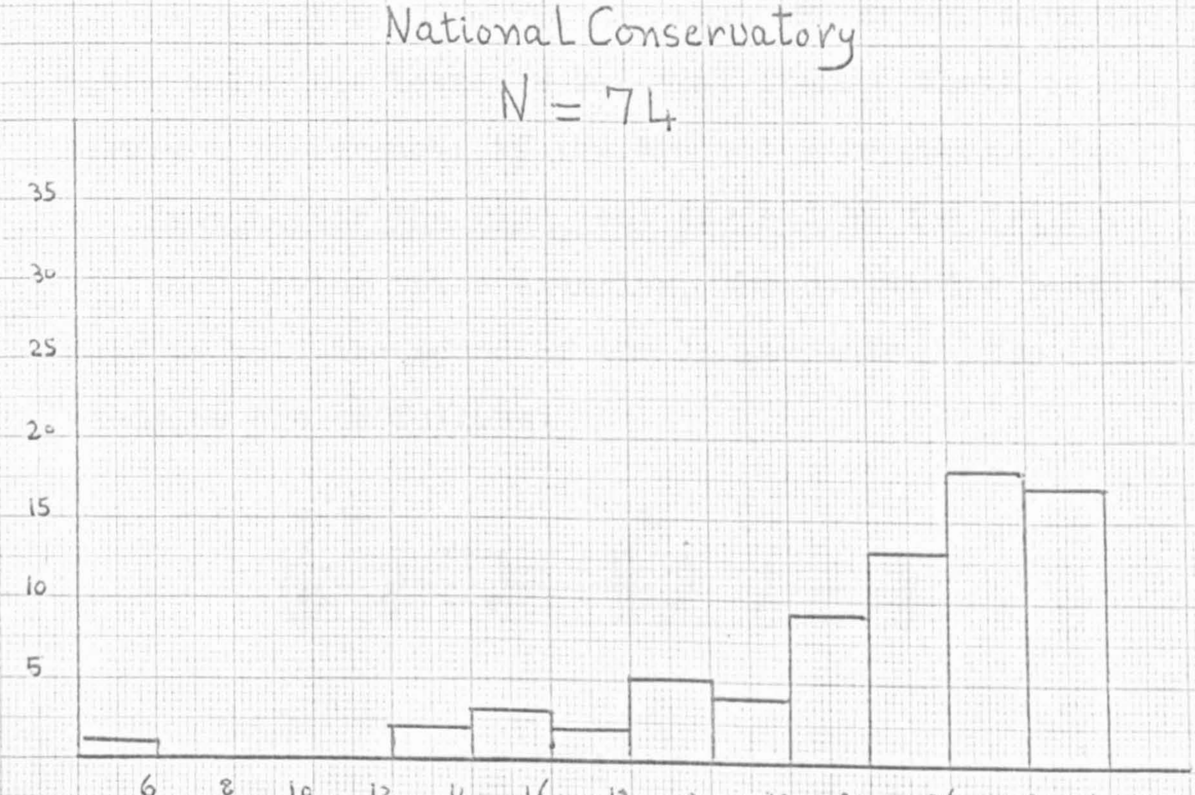
Table (40)

Seashore Rhythm Test.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
29-30	1	4	6	13	4
27-28	11	6	9	9	9
25-26	7	10	12	7	6
23-24	3	8	8	5	4
21-22	2	5	2	3	1
19-20	4	4	1	3	2
17-18	2	3		2	
15-16	1	1	1	1	2
13-14				1	1
11-12					
9-10					
7-8					
5-6				1	
N=	31	41	39	45	29
Mean	24.26	23.90	25.49	24.89	24.83
S.D.	3.84	3.66	3.02	5.36	4.39
Min.Max.	15-29	16-29	15-30	5-30	14-30

Figure (2)


Seashore Rhythm Test
General Preparatory Schools
N = 111
35
30
25
20
15
10
5
6
8
10
12
14
16
18
20
22
24
26
28
30


National Conservatory
N = 74
35
30
25
20
15
10
5
6
8
10
12
14
16
18
20
22
24
26
28
30

From this table, it is noticeable that all the children except one girl from the N.C. have obtained a better than chance score of 50%. The mean score in all groups is relatively high, and the distributions show that this test is easy for the majority of pupils. The following histogram.. Fig. 2 show the frequency distribution of the raw scores obtained by the two groups.

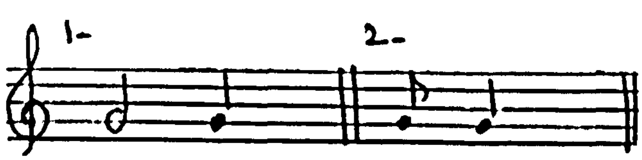
3. Seashore Time Test

Instructions.

"You will hear two tones which are different in length. If the second tone is longer than the first, you should blacken the space under the letter L for that item in the section of the answer sheet labelled "Time". If the second tone is shorter than the first, mark the space under the letter S for that item. There is always a difference; if you are not sure guess...".

Examples for the Time test devised by the Writer.

When giving these examples, the sustaining pedal was used to hold the sound of the longer note. The examples are as follows:



The following table (41) shows the frequency distribution, mean, S.D., minimum and maximum scores obtained by each school separately.

Table (41)

Seashore Time Test.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
46-50			1		
41-45	4	5	10	2	1
36-40	5	13	15	8	9
31-35	7	13	5	11	10
26-30	9	5	5	12	2
21-25	6	5	2	9	6
16-20			1	2	1
11-15				1	
N=	31	41	39	45	29
Mean	31.45	33.92	36.23	30.31	32.00
S.D.	6.81	5.41	6.54	7.02	6.18
Min. Max.	21-44	24-43	18-47	13-44	16-45

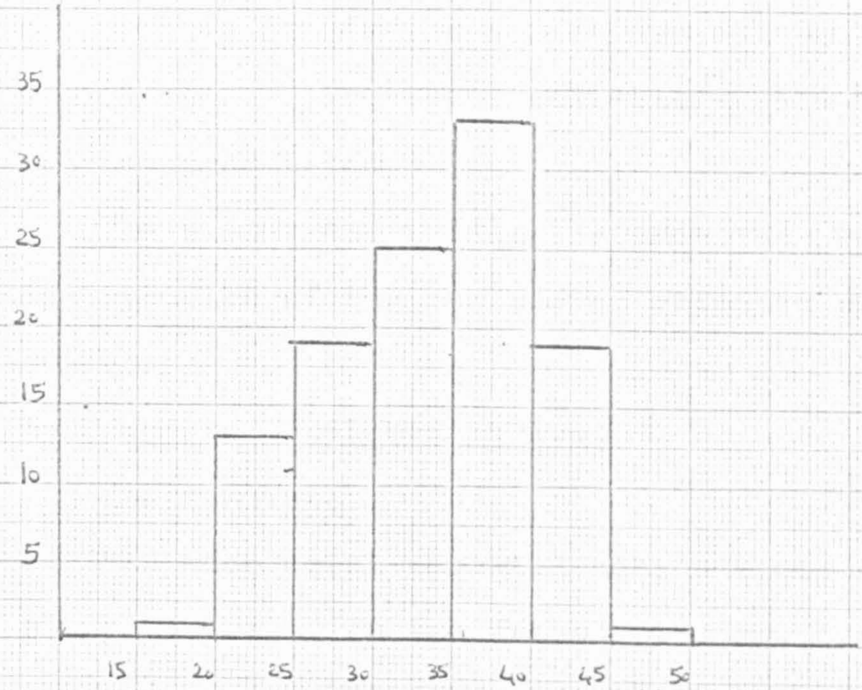
The distributions of scores as presented in the table shows that the test tends to have a normal distribution for girls, but to be skewed to the easy side for boys. Detailed discussion for sex differences in the two groups will be discussed below. The mean scores obtained by all the groups are higher than 60%, which

Figure (3)

Seashore Time Test

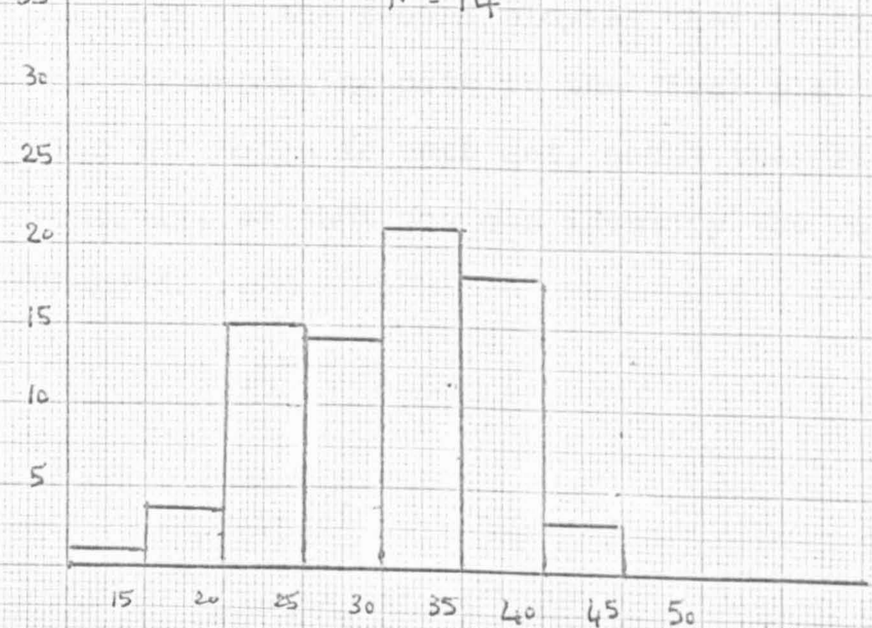
General Preparatory Schools.

N = 111



National Conservatory

N = 74



leads to the conclusion that, although this test has often been criticized as being long and boring, since it does not produce sounds nor actual musical problems, it is a good test. The test's reliability and validity will be discussed below.

The histograms in Fig.(3) show the frequency distribution of the raw scores obtained by the two groups.

4: Seashore Tonal Memory Test

Instructions.

"In each trial you will hear a short series of notes played twice. In the second playing, one note is changed. You are to decide which note is changed; the first, the second, the third, and so on, and blacken the space under that number in the section of the answer sheet labelled "Tonal Memocy". There is always one note in the second playing that is different from the corresponding note in the first playing. As you hear the notes in each set, count them silently to yourself, so that you can identify the note that is changed....."

Examples devised by the Writer.

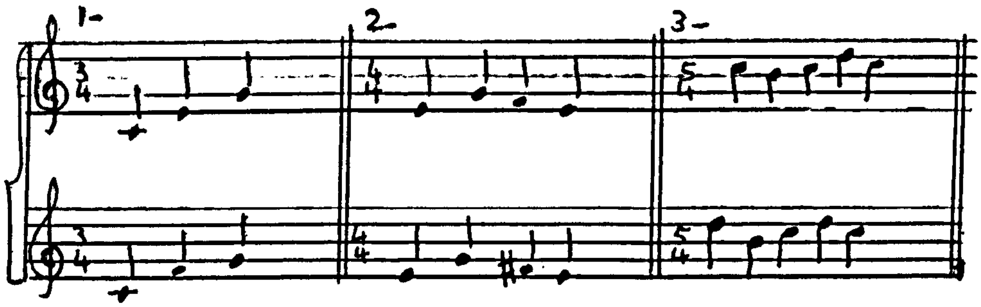


Table (42) shows the frequency distributions, mean, S.D., minimum and maximum scores obtained by each school separately.

Table (42)

Seashore Tonal Memory Test.

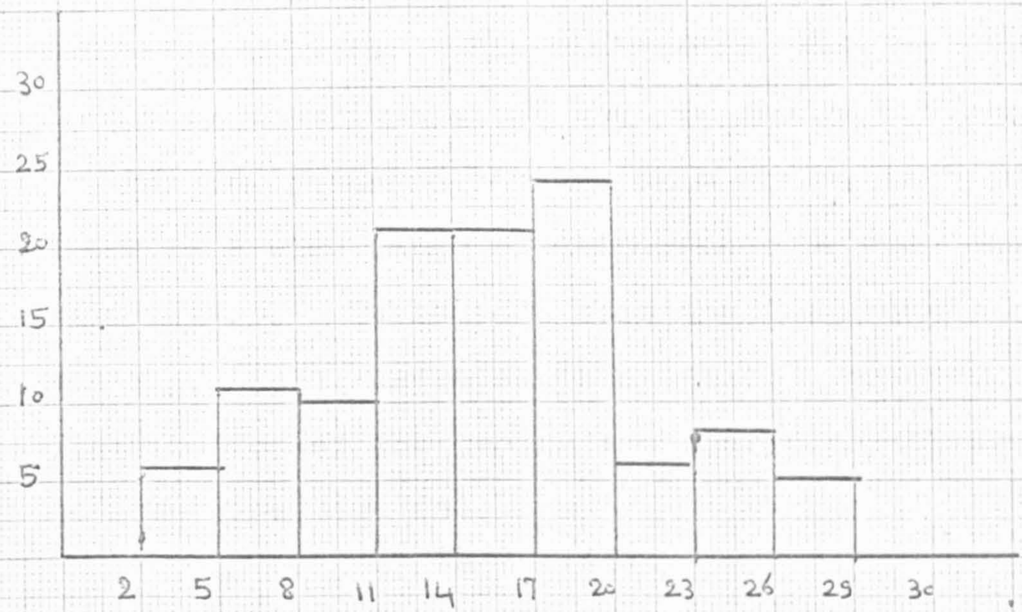
Interval	General Preparatory Schools			National Conservatory	
	Sch 1 Girls	Sch 2 Girls	Sch 3 Boys	Girls	Boys
30				1	1
27-29		2	2	14	3
24-26		3	5	5	4
21-23		1	5	4	7
18-20	7	9	8	3	2
15-17	8	3	10	3	3
12-14	6	9	6	4	3
9-11	5	4	1	2	2
6-8	3	7	1	6	4
3-5	2	3	1	2	
0-2				1	
N=	31	41	39	45	29
Mean	13.58	14.39	18.08	19.13	18.79
S.D.	4.57	6.84	5.26	8.83	7.49
Min. Max. Scores	3-20	3-29	5-28	1-30	6-30

Figure (4)

Seashore Tonal Memory Test

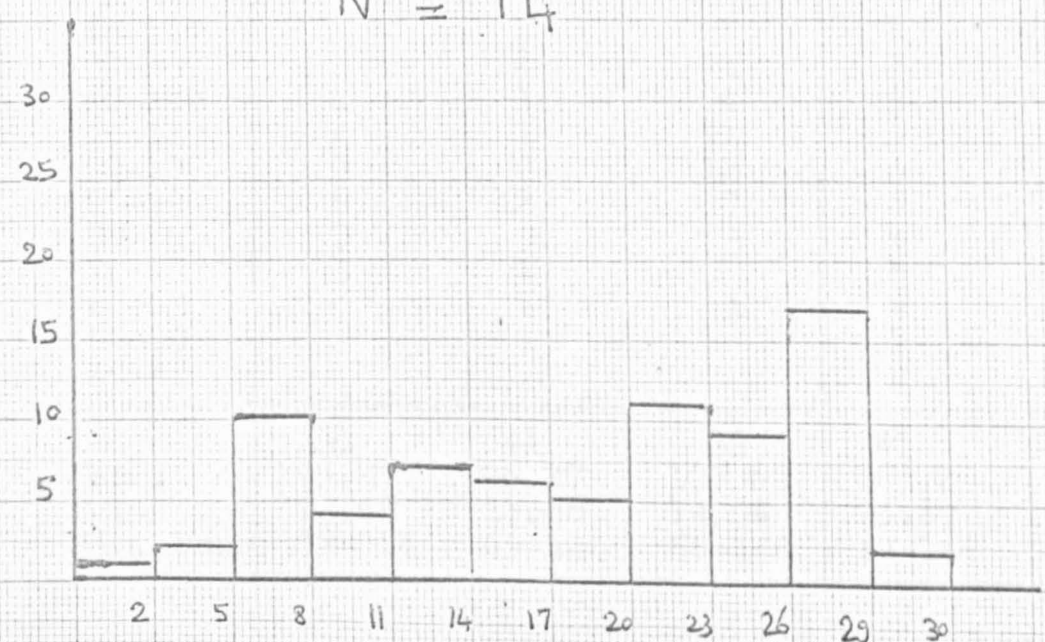
General Preparatory Schools

N = 111



National Concervatory

N = 74



In this test, there are a considerable variety between the different schools.. The boys in the GPS group obtained a comparatively higher mean than that of the two girls schools. In the N.C. groups, girls are better and obtained the highest mean in all the different schools. The histograms Fig. (4) show the frequency distribution of the raw scores of both groups.

For the Seashore battery as a whole, in both groups there is a wide range of differences between the individuals. Table (43) show the two group's results and Fig. (5) illustrates this table. However, the distribution of the scores are nearly normal as can be seen from Fig. (5).

Table (43)

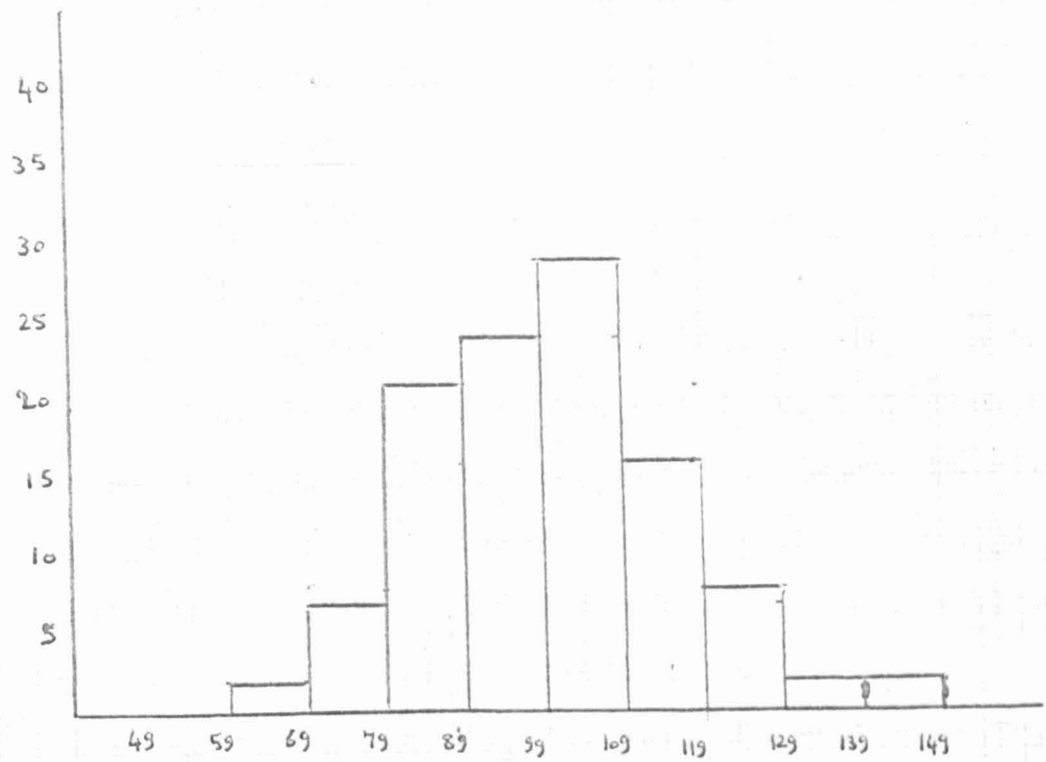
Seashore Total Scores.

Interval	General Preparatory Schools			National Conservatory	
	Sch 1 Girls	Sch 2 Girls	Sch 3 Boys	Girls	Boys
140-149		1	1	1	
130-139		1	1	7	3
120-129	1	3	4	9	6
110-119	4	1	11	5	4
100-109	9	9	11	4	3
90-99	5	12	7	4	6
80-89	9	9	3	4	5
70-79	3	4		5	2
60-69		1	1	4	
50-59				1	
40-49				1	
N=	31	41	39	45	29
Mean:	95.97	96.27	107.69	103.29	105.17
S.D.	13.66	17.68	14.04	25.89	19.37
Min. Max.	72-126	69-144	66-140	48-146	70-135

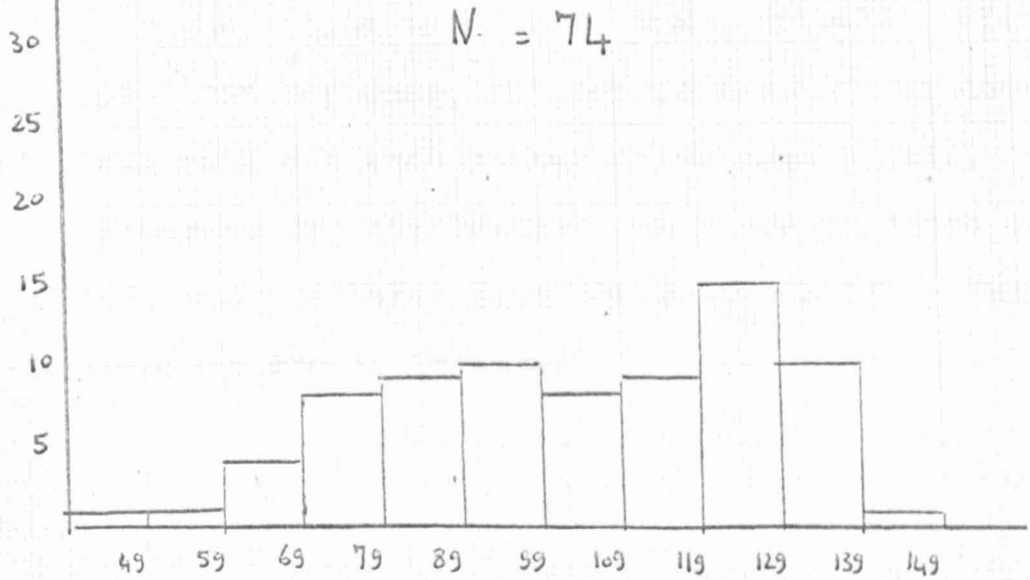
Figure (5)

Seashore Total Scores

General Preparatory Schools
N = 111



National Conservatory
N = 74



As can be noticed from table (43), the boys from the less selected group gave the highest mean score and the difference between boys and girls within this group is great. However, the differences between the two sex groups within the selected group are not great.

2: Bentley Tests

Instructions (1966).

1. Pitch Test

"Listen to these two sounds (ex.1); the second is higher than the first and has moved "up". Listen to these two sounds (ex. 2); now the second is lower than the first; it has moved "down". The next two sounds (ex. 3) are the "same". Some of the sounds you will hear are much closer together than you might expect. Listen to these (ex. 4), the second sound goes "up" from the first. Now listen to one that goes "down" (ex. 5). So, if the second sound is the same as the first, write "S", if the second sound goes up, write "U", if the second sound goes down, write "D". Is that clear? "S" for same; "U" for up and "D" for down. I shall call out each number as we come to it".

Examples for the Bentley tests are provided on the record, and are taken from the test itself. The differences are as follows:-

Ex.

1 is item no. 2 : one semi-tone "up".
2 " 1 : " "down".
3 " 9 : the two notes are the same.
4 " 12 : 6 c.p.s. "~~down~~" "up".
5 " 13 : 6 c.p.s. "down".

In the Arabic version, instead of writing the letters "S", "U", and "D", subjects were instructed to put a simple (✓) in the proper column of the answer sheet.

The following table shows the frequency distribution, mean, S.D., and minimum and maximum scores obtained by the childrens' groups.

Table (44)

<u>Bentley Pitch Test.</u>

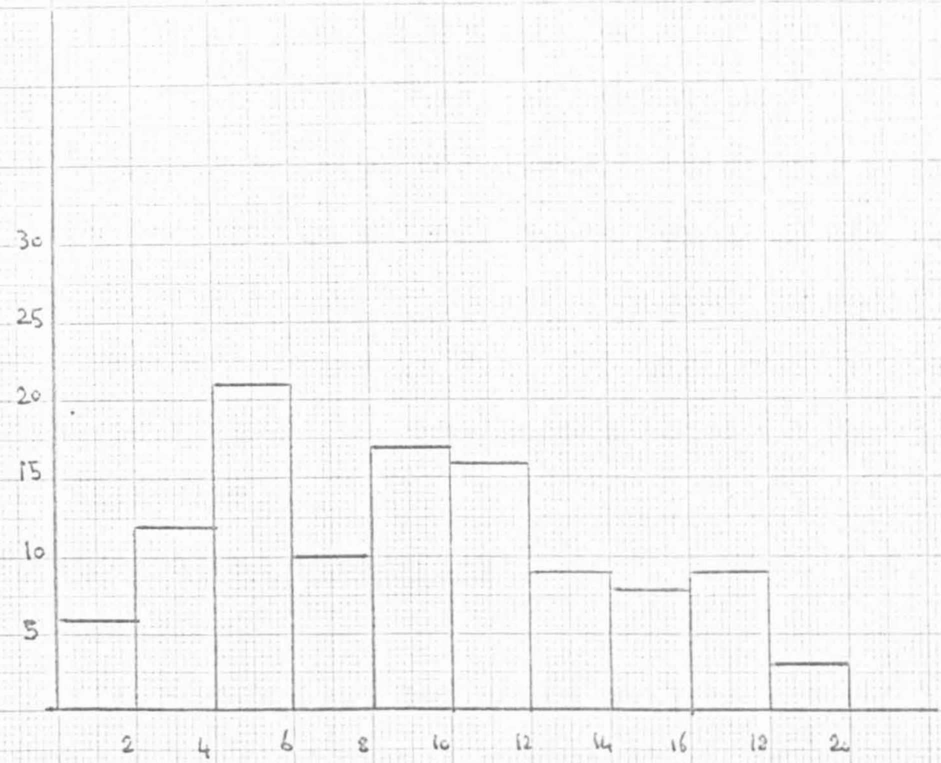
Interval	General Preparatory Schools			National Conservatory	
	Sch. I Girls	Sch. II Girls	Sch. III Boys	Girls	Boys
19-20	-	3		3	2
17-18	-	4	5	3	8
15-16	-	1	7	6	2
13-14	-	2	7	4	-
11-12	-	6	10	9	-
9-10	5	7	5	3	3
7-8		8	2	7	3
5-6	12	6	3	4	3
3-4	10	2		4	5
1-2	4	2		2	3
N	31	41	39	45	29
Mean	4.97	9.93	12.38	10.36	10.24
S.D.	2.44	4.73	3.42	4.97	6.68
Min. Max.	1-10	19-2	6-18	1-20	1-19

Figure (6)

Bentley Pitch Disc. Test

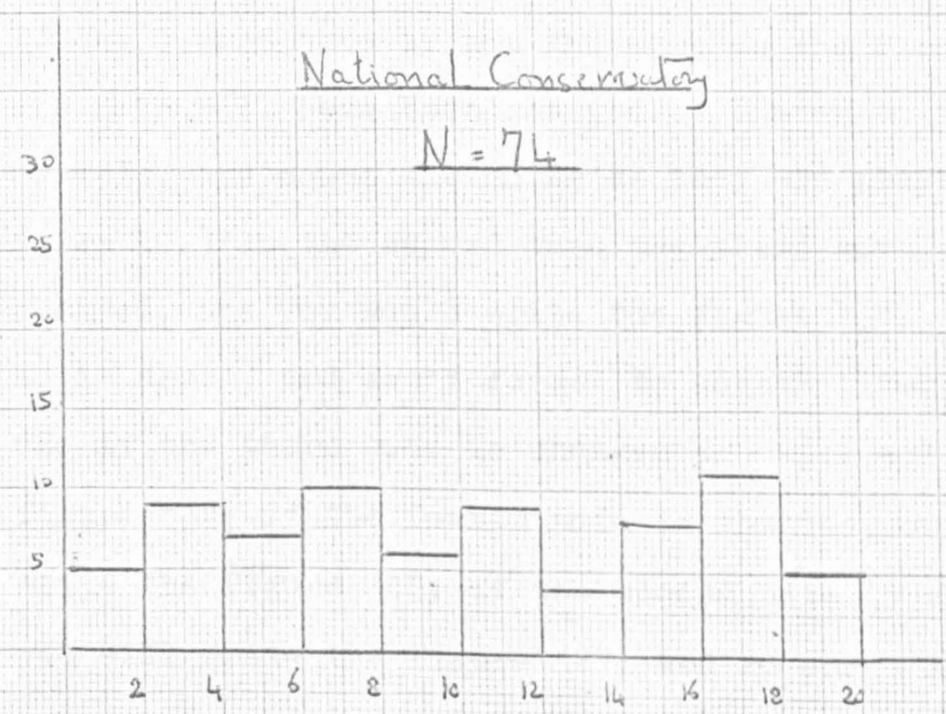
General Preparatory Schools

N = 111



National Conservatory

N = 74



In this test, again there are variations in the distributions of scores. They tend to be normal in G.P. Schools 2 and 3 and in the N.C. girls. The mean scores are greater than 50% except in the first school. In both pitch tests the distributions for school I tend to be positively skewed, which may indicate that for this school, the pitch tests are comparatively difficult.

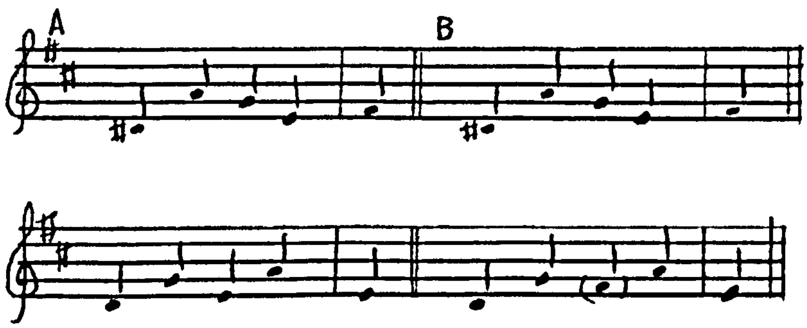
The Histograms in Fig. (6) show the frequency distribution of the raw scores obtained by the two groups in this test.

<u>Bentley Tonal Memory Test.</u>

Instruction.

"For each item two tunes will be played , like this (second half of item 4 repeated). If the second tune is the same as the first, as that was, write "S". If the second tune is not the same as the first, one note will have been changed. Listen to this example, and count the notes as they are played" (item 10.)"In the second tune the third note is changed, and you would write the figure "3". Listen to it again, and don't forget to count" (Item 10). "So if the third note is changed you will write the figure "3"; if the fourth note is changed you will write the figure "4"; if the second note is changed you will write the figure "2"; and so on. All the

tunes have five notes; count them as they are played."
Examples provided on the record are taken from the test itself, and are as follows:



The instructions for this test were followed and translated into Arabic. But, when the response for any item was the same "S" the children were instructed to put (✓) instead of a letter. The answer form was similar to that provided by Bentley. (The Arabic instructions are to be found in Appendix. II.

The following table and histogram shows the frequency distribution of raw scores, means, S.Ds and minimum and maximum scores obtained by each school separately.

——————— As can be noticed from table (44)(a) the mean score in all schools except the first is over 50%. However, like most of the tests, the distribution of raw scores is not normal and the boys scored better than the girls. The histograms in Fig.(7) shows the distribution of the raw scores obtained by the two groups.

Table (44)(a)

Bentley Tonal Memory Test

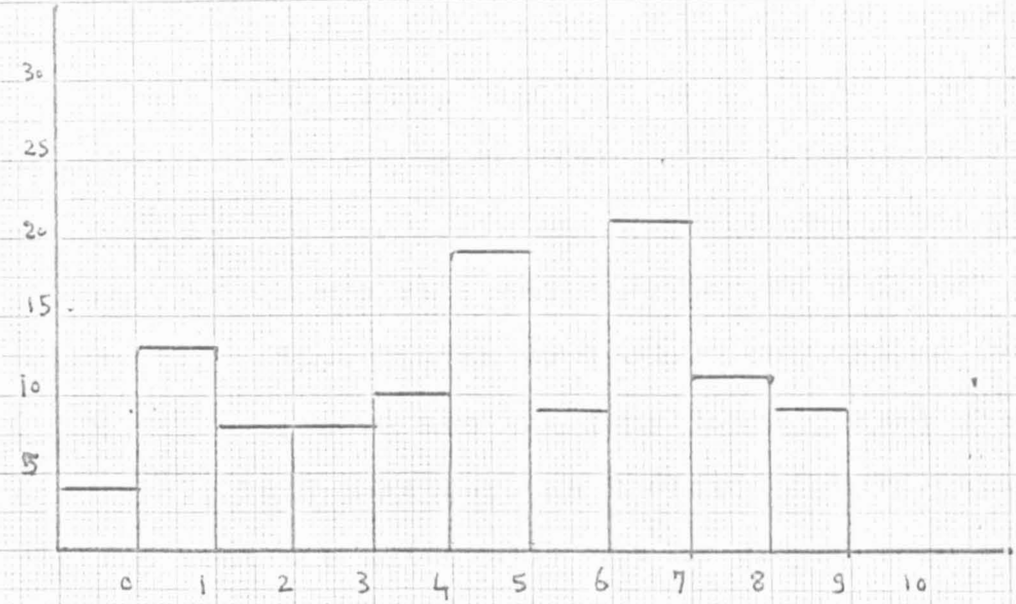
Interval	General Preparatory Schools			National Conservatory	
	Sch I. Girls	Sch IIGirls	Sch III Boys	Girls	Boys
10				3	8
9		4	5	5	2
8	1	2	8	4	5
7	3	10	8	8	2
6	1	4	4	6	1
5	6	6	7	8	4
4	3	3	4	3	1
3	2	3	2	1	2
2	5	3		3	2
1	8	4	1	1	2
0	2	2		3	
N	31	41	39	45	29
Mean	3.26	5.05	6.33	5.69	6.69
S.D.	2.32	2.65	1.96	2.64	3.06
Min-Max	0-8	0-9	1-9	0-10	1-10

Figure (7)

Bentley Tonal Memory Test

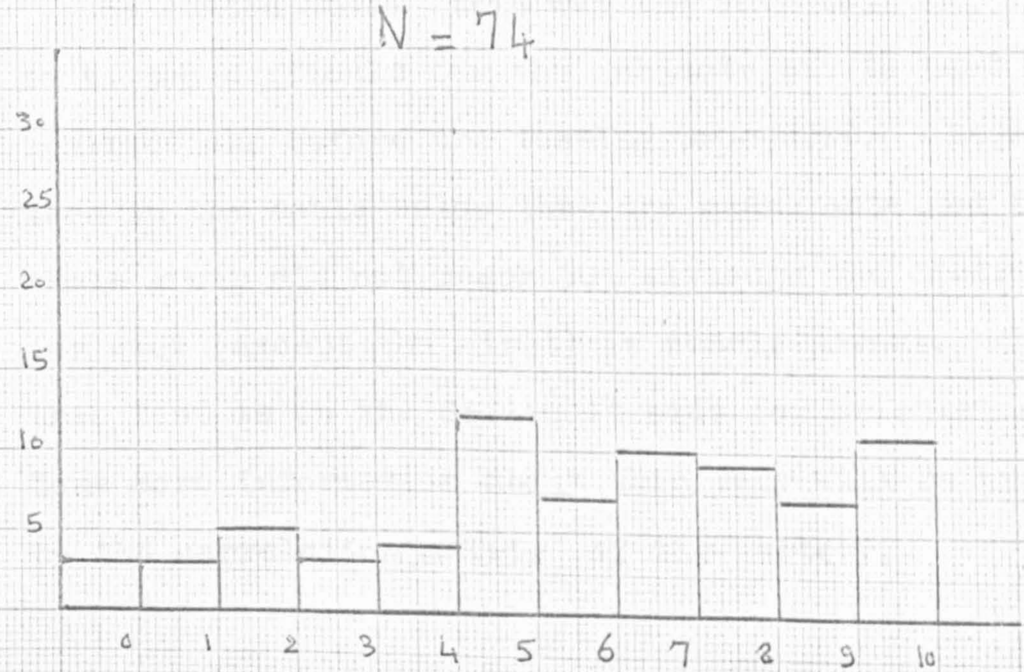
General Preparatory Schools

N = 111



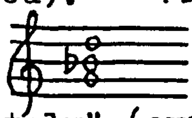
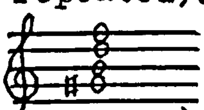
National Conservatory

N = 74



The Bentley Chord Analysis Test.

Instruction: (Bentley 1966 p. 74-75)

"You will hear chords; that means groups of notes played together. For example here is a chord containing  two notes. Listen to the two notes played separately " (example); "and again, together as a chord" (chord repeated). ". Here is another chord containing three notes  . Listen to the three notes played separately" (example)"; and together, as a chord" (chord repeated). "Now listen to a chord containing four notes  ; here are the four notes played separately" (example); "and together, as a chord" (chord repeated). "In the test the notes will not be played separately; they will be played together, as chords. Listen carefull and write down the number of notes you hear in each chord."

As stated above this was the only test which seemed to be too difficult for the subjects and to need more instructions before the testing procedure. It will be seen in the table below that the means obtained by the whole group did not reach 50% although the distribution for each (except the first) is nearly normal. Thus this test is on the difficult side for oriental subjects. Some more information about this test will be provided by the correlation matrix of the battery.

Table (45)

Bentley Chord Analysis Test.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch 2 Girls	Sch 3 Boys	Girls	Boys
17-18				1	1
15-16		3	2	4	1
13-14	1	4	2	3	3
11-12	3	5	6	7	7
9-10	1	9	14	6	7
7-8	7	8	7	11	3
5-6	11	8	5	6	2
3-4	8	3	2	4	1
1-2		1	1	3	4
N=	31	41	39	45	29
Mean	6.42	8.90	8.90	8.38	9.17
S.D.	2.61	3.64	3.13	3.91	4.23
Min. Max.	3-13	1-15	1-16	1-17	2-17

In all schools the mean score obtained is below the 50% of the total. This may indicate that this test is fairly difficult for both groups. The histograms in Fig. (8) show the frequency distribution of raw scores obtained by the two groups in the test.

Bentley Rhythmic Memory Test.

Instructions. (Bentley 1966 p. 75)

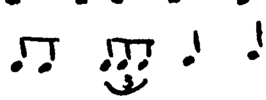
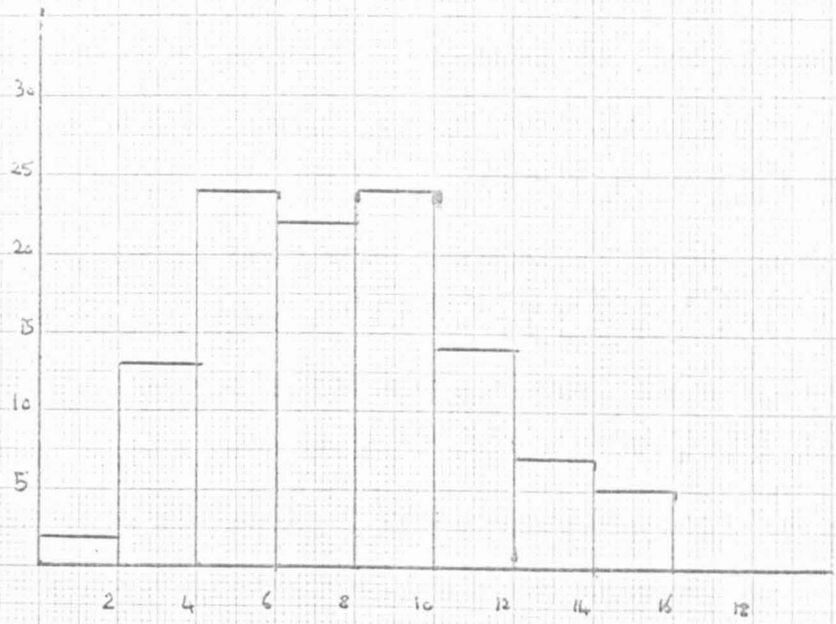
"You will hear two patterns of notes. Each pattern has four beats, or pulses, like this: one two three four  or like this: one two three four 

Figure (8)

Bentley Chord Analysis Test

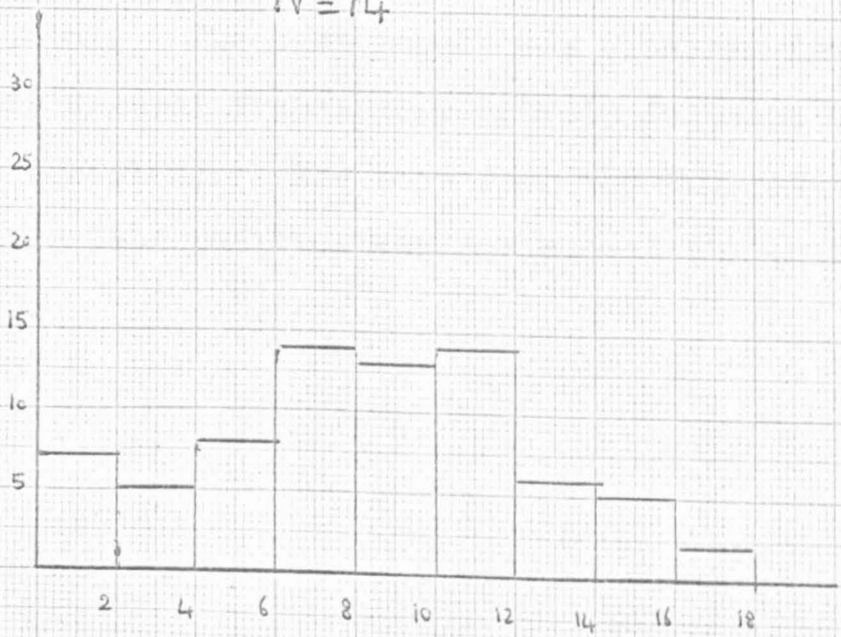
General Preparatory Schools

N = 111

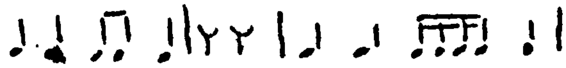


National Conservatory

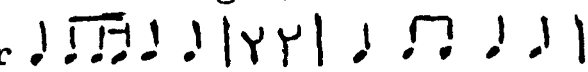
N = 74



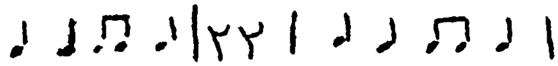
If the second pattern is the same as the first, write "S", for "same", if the second pattern is different from the first, write down the number of the beat or pulse that is changed. Listen to this example and see if you can decide which beat is changed:

One two three four 

Yes, the third beat was changed. Here is another:

One two three four 

There the second beat was changed. Here is another:

One two three four 

Those were the same. Your answers will be either 1, or 2 or 3 or 4 if there is a change, or S if the two patterns are the same. Now here is the test".

These instructions together with the examples were followed exactly except in the case of "S", where the subjects had to place (✓) in the proper place.

In all the schools the mean scores exceeded 60% of the total. The best result was obtained from the boys in the General Preparatory schools followed by the girls from school(2). The boys from the N.C. came third and the last position was for school (1) in the G.P.S. group.

Table (46)

Bentley Rhythmic Memory

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch 2 Girls	Sch 3 Boys	Girls	Boys
10	1	4	11	1	
9	1	14	2	6	8
8	3	8	12	8	4
7	5	7	6	3	5
6	9	2	4	12	2
5	8	2	2	7	2
4	2	3		4	3
3	2	1	2	1	5
2				2	
1				1	
N=	31	41	39	45	29
Mean	6.00	7.71	7.87	6.15	6.48
S.D.	1.59	1.12	1.89	2.04	2.28
Min. Max.	3-10	3-10	3-10	1-10	3-9

Like the Seashore Rhythm test, the mean scores are high. From Fig. (9) it can be seen that the histograms are skewed to the easy side. This may indicate that this test is fairly easy for the children group.

In Bentley's test battery as a whole, except in school I from the G.P.S. group all the mean scores obtained are above 50% of the total. Generally, boys gave a higher mean score than girls in both groups, but the difference is greater in the less selected group.

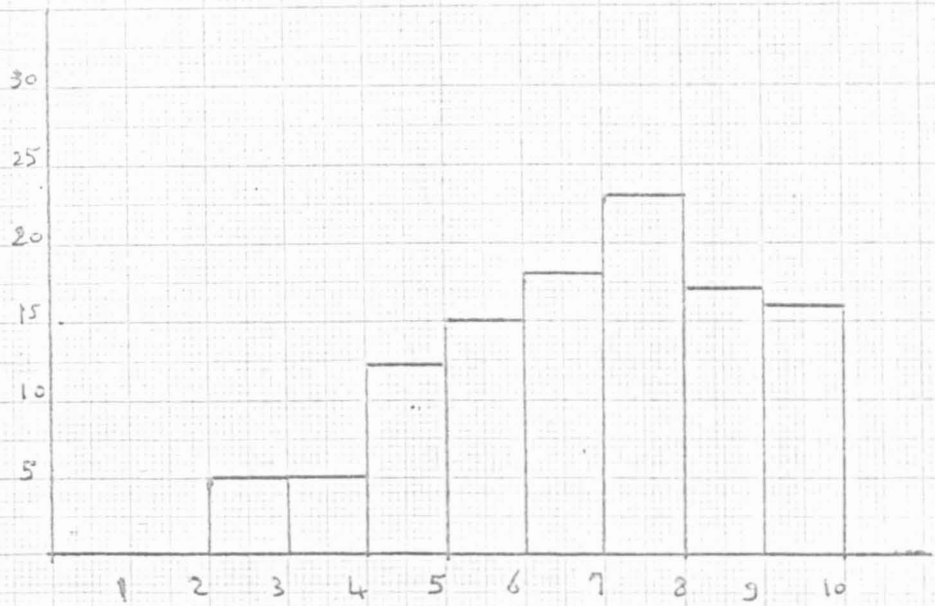
Table (47) and Fig. (10) illustrate the distribution of scores in both groups.

Figure (9)

Bentley Rhythm Test

General Preparatory Schools

N = 111



National Conservatory

N = 74

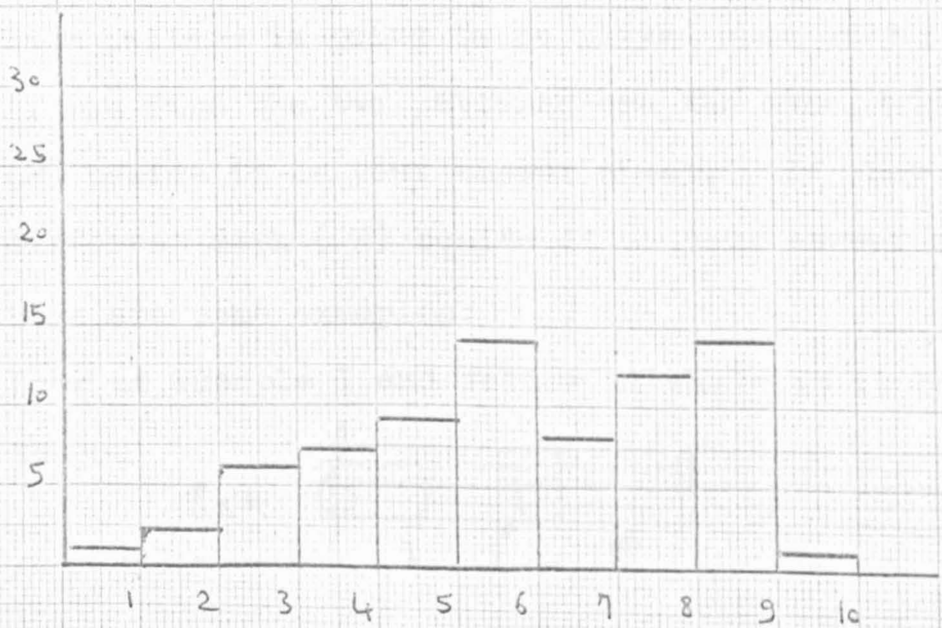


Table (47)

Bentley Total Scores

Interval	General Preparatory Schools			National Conservatory	
	Sch 1 Girls	Sch 2 Girls	Sch 3 Boys	Girls	Boys
51-60		1		2	1
41-50		5	10	6	10
31-40	2	14	18	13	3
21-30	12	17	10	17	9
11-20	15	3	1	5	6
1-10	2	1		2	
N=	31	41	39	29	29
Mean	21.45	31.58	35.49	30.58	32.24
S.D.	6.33	9.20	7.09	10.59	11.60
Min.Max. Sc.	9-39	9-51	17-48	6-54	13-51

The New Tests in the Battery.

1. Melody Identification.

Instructions:

In this test, you will hear short melodic patterns which are printed on your answer sheet. Each pattern is going to be played once on the piano. If you find the two patterns are the same, mark (✓) beside it on your answer sheet. If they are different mark (X) beside it on your answer sheet. Here are some examples:

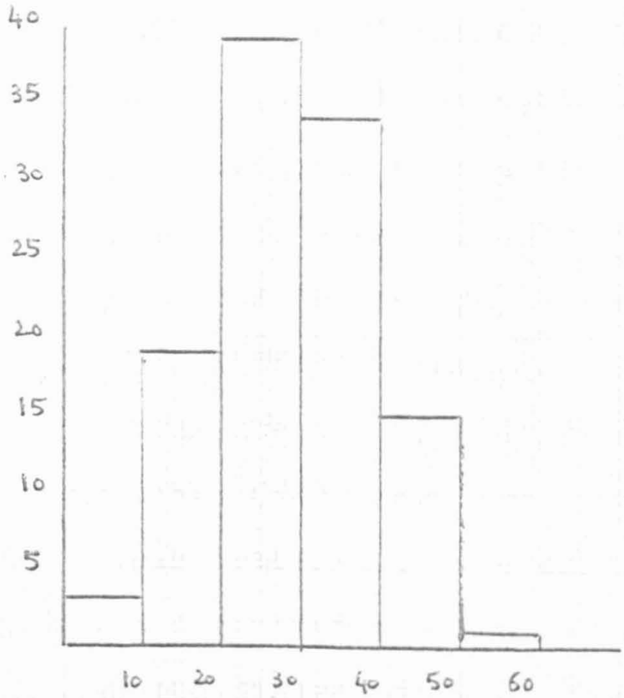
Look at example I and follow it while it is being played to you

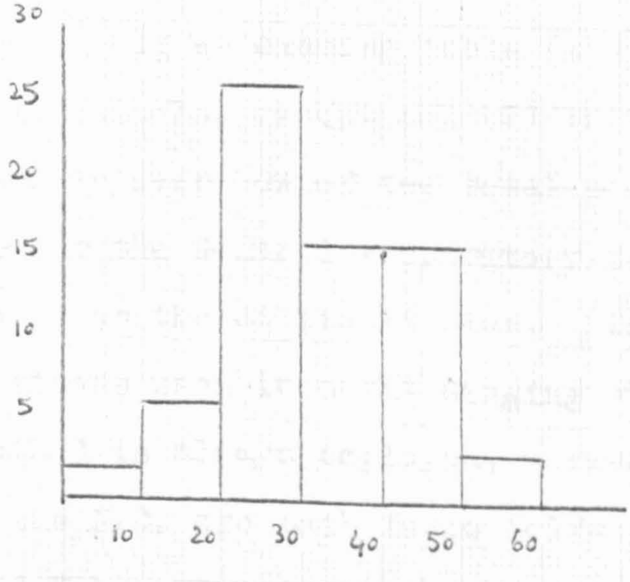
Ex:1-

Figure (10)

Bentley's Total Scores

General Preparatory Schools
N = 111





Those were the same, so your answer should be(✓)
beside example (1).

Now look at example (2) 

Here the two patterns are different, because the second note is changed. Listen to it again and try to follow it.(example 2). Have you noticed the second note? It is changed, so your answer should be (X).

Now when you find the two patterns are the same mark (✓) and when different mark (X).

The test items are included in Appendix III. The following table (48) shows the frequency distribution of the raw scores obtained by the chidrens' groups, means, S.Ds., and minimum and maximum scores; and figure 11 illustrates the distribution of the scores of the two groups.

If we examine table. (48) we will find that in all schools, except no. (2) in the G.P.S., the mean score is over 50% of the total possible. However, for the General Preparatory Schools, the test tends to be on the difficult side. This may be due to the methods used in sight singing where the Tonic Solfa method is always employed, whereas the methods uesd in the N.C. are both Tonic Solfa (movable Doh) and Fixed Doh. In giving this test the tonic is

Table (48)

Melody Identification.

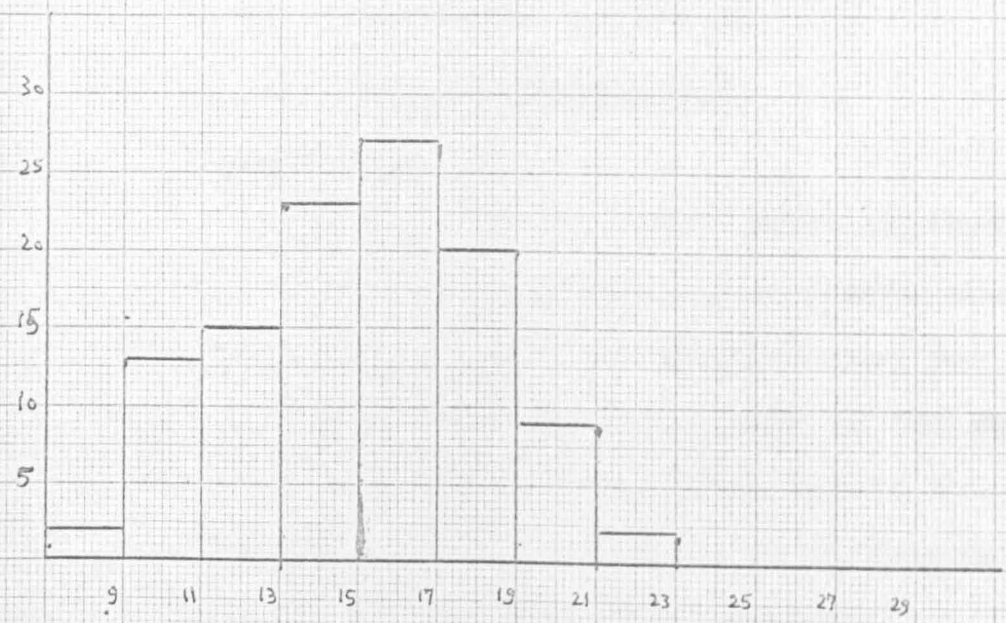
Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
28-29					3
26-27				2	1
24-25				2	3
22-23		2		2	5
20-21	2	1	6	6	3
18-19	8	3	9	8	4
16-17	12	8	7	16	4
14-15	4	13	6	6	3
12-13	4	3	8	2	3
10-11	1	9	3	1	
8-9		2			
6-7					
N	31	41	39	45	29
Mean	16.35	14.49	16.05	17.60	19.93
S.D.	2.48	3.38	3.25	3.20	4.87
Min-Max	11-21	8-22	10-21	11-27	12-28

Figure (11)

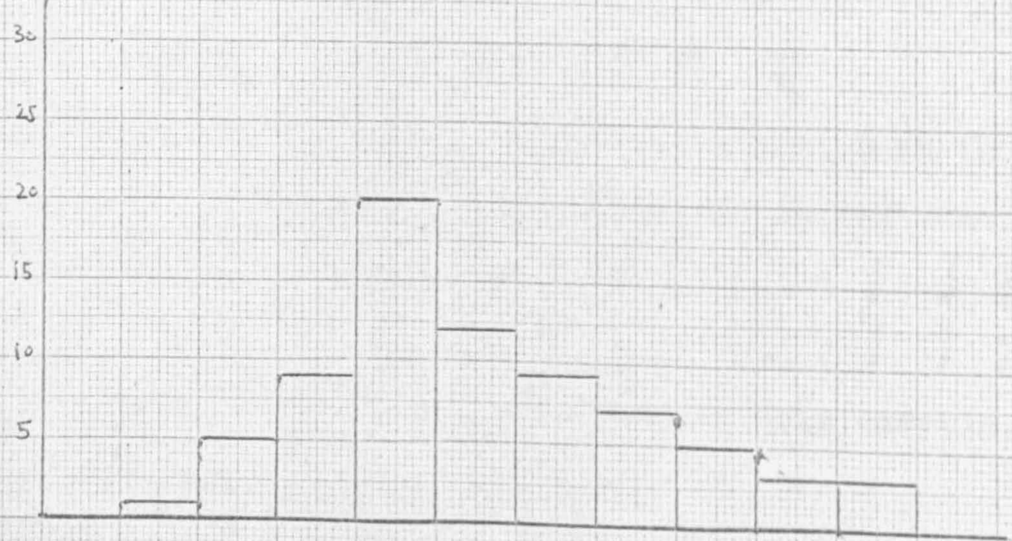
Melody Identification

General Preparatory Schools

N = 111



National Conservatory



not sounded before each item, hence it is difficult for those who follow the Tonic Solfa, while for those who can follow the relations between the intervals, regardless of tonic, it is easier.

<u>The Rhythmic Identification Test</u>

<u>Instructions</u>

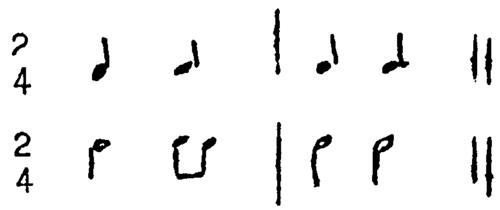
In this test, you will hear short rhythmic patterns which are printed on your answer sheet. Each pattern is going to be clapped once for you. If you find the pattern which you hear is the same as that printed on your answer sheet mark (✓) in the space provided beside it. If they are different <u>circle</u> the pulse where the alteration occured.

Here are some examples.

Look at example (I) and follow it while being clapped for you:

1. Printed

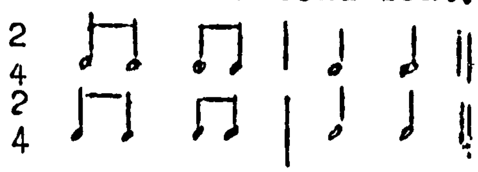
Clapped



Have you noticed that the second beat is altered? Now your answer is to circle the second beat.

Now Ex. 2: Printed

Clapped



Now no mistakes have occured in this example. So mark (✓).

So if you find that they are the same mark (✓) and if you find any mistakes, circle the pulse where you think the alteration occured.

The test items are included in Appendix III.

Table (49) shows the frequency distribution of the raw scores, means, S.D.s, minimum and maximum scores obtained by the different schools.

Table (49)

Rhythmic Identification.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
28-29				2	
26-27				2	1
24-25				3	1
22-23		1	1	1	2
20-21	1	1		7	3
18-19	2	3	1	4	1
16-17	6	3	4	6	4
14-15	6	7	4	8	3
12-13	10	9	6	7	11
10-11	4	8	11	2	1
8-9	2	2	4		
6-7		4	1	2	
4-5		2	2		1
2-3			3	1	
0-1		1	2		1
N=	31	41	39	45	29
Mean	13.74	12.15	10.74	16.93	15.17
S.D.	2.94	4.50	5.06	5.60	5.40
Min. Max.	8-20	1-22	0-23	3-29	1-26

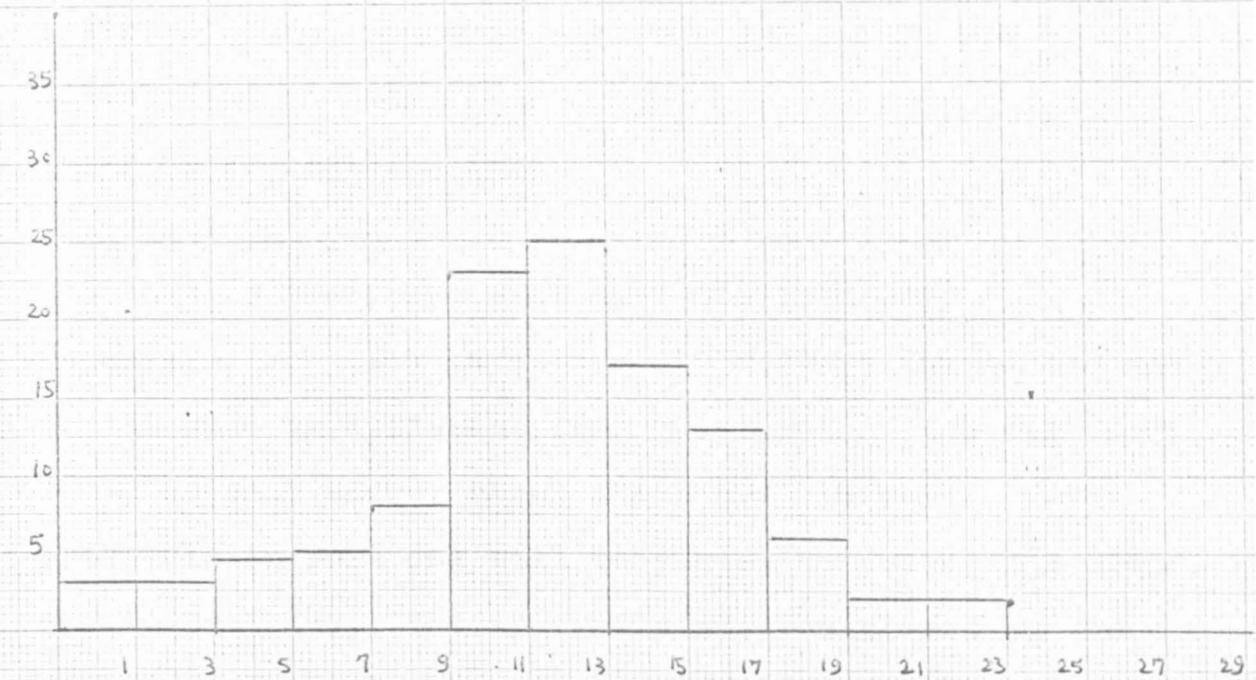
The mean scores of the Preparatory schools are lower

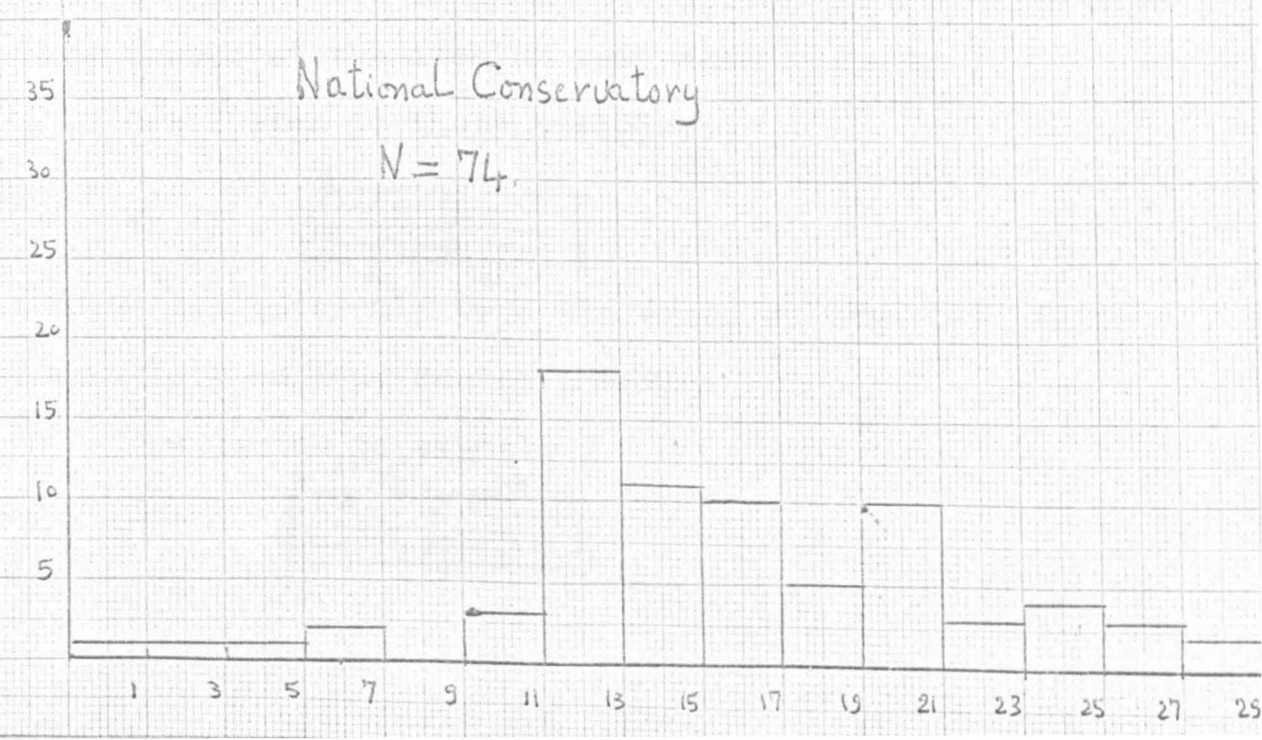
Figure (12)

Rhythmic Identification

General Preparatory Schools

N = 111





than those of the N.C. The statistical significance of this difference will be discussed below. However, the distribution of scores is nearly normal. Generally girls scored better than boys in this test. The distribution of the scores of the two groups are illustrated in Fig. (12).

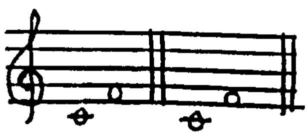
Interval Recognition Test.

Instructions

In this test, you will hear two intervals successively. You have to state whether the second one is the same or different from the first. You will notice that, on your answer sheet there are two parts. The intervals in part one will be played to you on the piano, and in part two, the intervals will be played on the violin. In Both parts when you find the two intervals are the same mark (✓), and if different mark (X) beside the number of the item on your answer sheet.

Now listen to these examples:

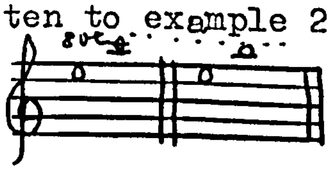
Ex. I



These two intervals were the same, so mark (✓) beside example 1 on your answer sheet.

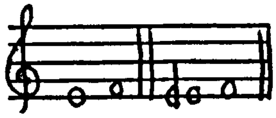
Now listen to example 2

Ex. 2



Have you noticed that these intervals were different? Now mark (X) beside example 2 on your answer sheet.

Now listen to this one on the violin:

Ex. 3 

Have you noticed that they are different? Now mark (X) beside example (3)

The test items are included in Appendix III. In the following tables, the frequency distributions of the raw scores in the whole test and in each part separately are tabulated, and figures13-15 illustrate the distributions of the scores.

Table (50)

Interval Recognition Total

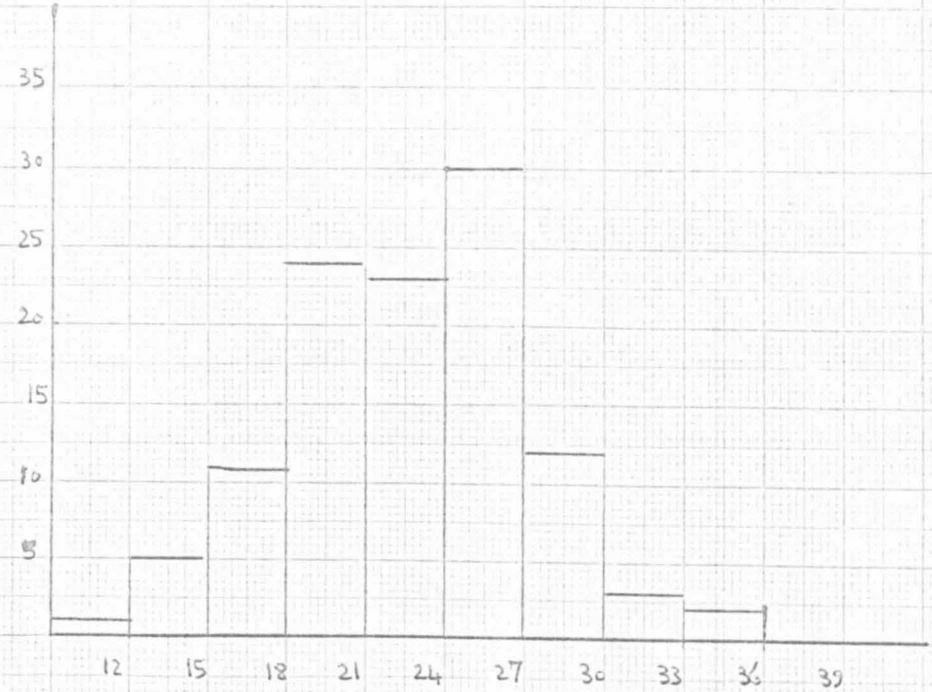
Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
40-					
37-39					1
34-36			2	1	2
31-33		1	2	2	4
28-30	1	4	7	12	7
25-27	2	8	20	6	5
22-24	10	7	6	5	5
19-21	6	17	1	3	1
16-18	6	4	1	14	3
13-15	5			2	
10-12	1				1
N=	31	41	39	45	29
Mean	20.13	22.56	26.92	22.82	26.48
S.D.	4.21	3.67	3.46	5.80	6.11
Min.Max.	11-29	16-31	16-34	15-34	12-37

Figure (13)

Interval Recognition (Total)

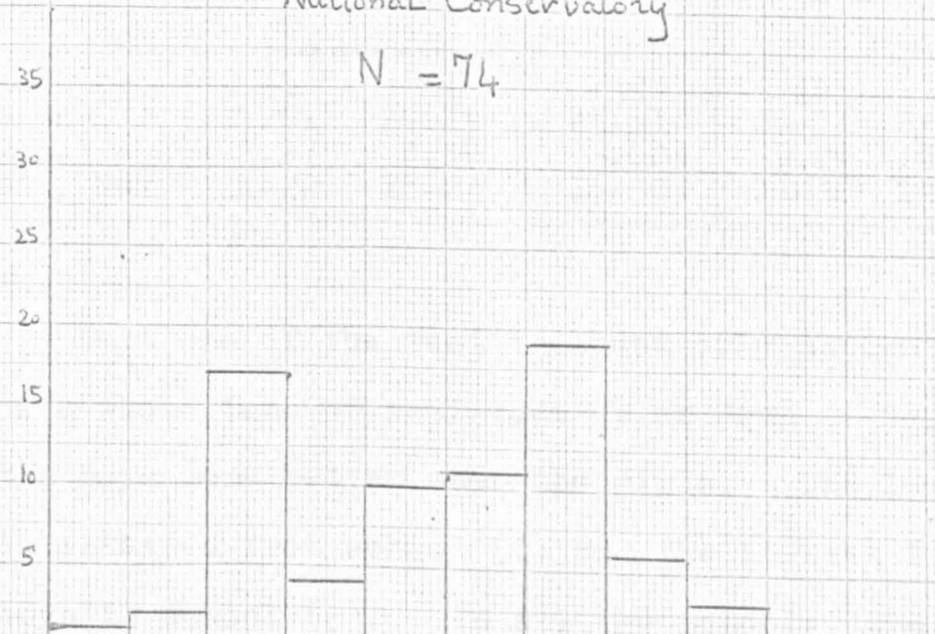
General Preparatory Schools

N = 111



National Conservatory

N = 74



The table shows that the mean scores for the whole test for all the groups exceeded 50% of the total possible Again the boys are better than the girls. The lowest mean score is obtained by school (1), and the highest by school (3).

Table (51)

Interval Recognition (Western Items).

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
31-32					
29-30			1	1	3
27-28			4	5	2
25-26			9	9	6
23-24		12	9	4	7
21-22	6	7	11	3	2
19-20	11	8	4	4	2
17-18	3	11		7	1
15-16	6	3	1	8	3
13-14	3			3	2
11-12	2			1	1
N=	31	41	39	45	29
Mean	17.61	20.19	23.51	20.71	22.59
S.D.	3.27	2.58	3.00	5.04	5.49
Min. Max.	11-22	15-24	16-30	11-30	12-30

Part one of the test included only alterations of a whole tone or semi-tone up or down. Here too the boys were better than the girls. The lowest mean is obtained from school (1) and the highewt from the boys in school (3). In all the schools, the mean

The table shows that the mean scores for the whole test for all the groups exceeded 50% of the total possible Again the boys are better than the girls. The lowest mean score is obtained by school (1), and the highest by school (3).

Table (51)

Interval Recognition (Western Items).

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
31-32					
29-30			1	1	3
27-28			4	5	2
25-26			9	9	6
23-24		12	9	4	7
21-22	6	7	11	3	2
19-20	11	8	4	4	2
17-18	3	11		7	1
15-16	6	3	1	8	3
13-14	3			3	2
11-12	2			1	1
N=	31	41	39	45	29
Mean	17.61	20.19	23.51	20.71	22.59
S.D.	3.27	2.58	3.00	5.04	5.49
Min. Max.	11-22	15-24	16-30	11-30	12-30

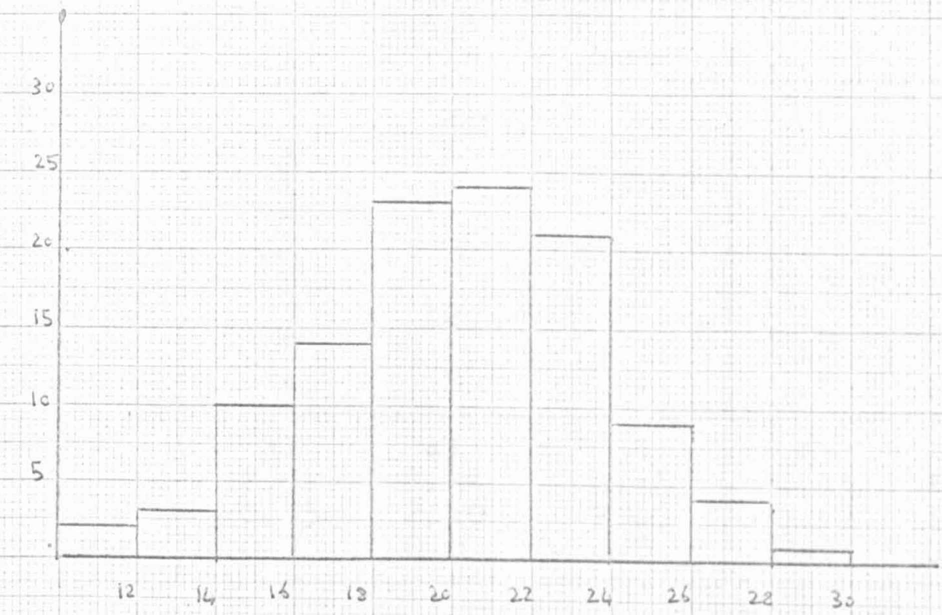
Part one of the test included only alterations of a whole tone or semi-tone up or down. Here too the boys were better than the girls. The lowest mean is obtained from school (1) and the highewt from the boys in school (3). In all the schools, the mean

Figure (14)

Interval Recognition (Western Items)

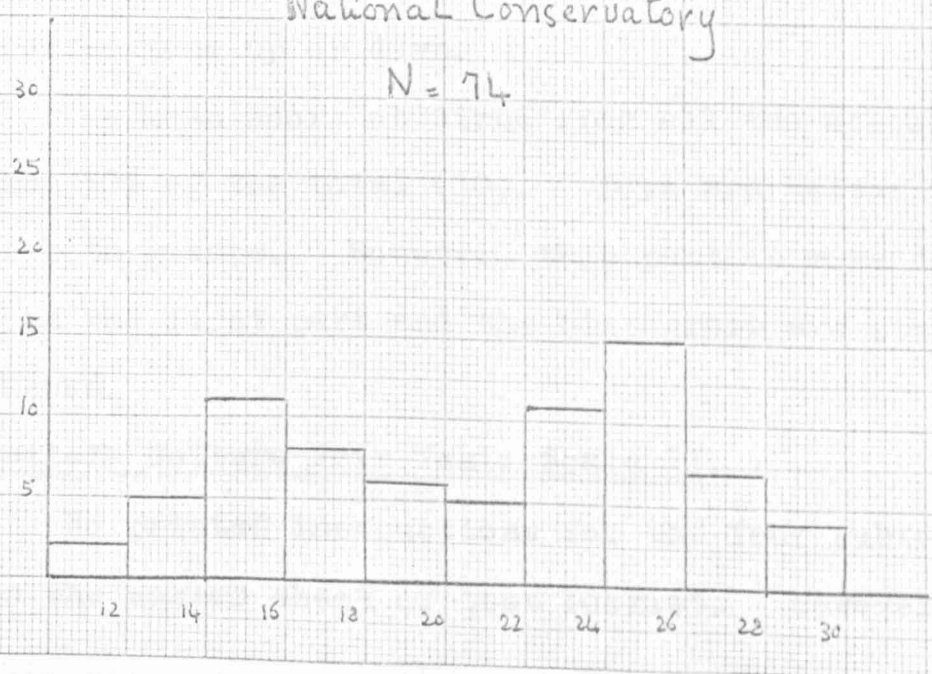
General Preparatory Schools

N = 111



National Conservatory

N = 74



scores exceeded 50% of the total.

Table (52).

Interval Recognition (Oriental Items).

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
8		2	2	1	
7	1	1	1		1
6	1	1	2	3	4
5	2	1	6	2	7
4	3	3	7		6
3	8	7	8	8	5
2	7	12	7	13	4
1	5	5	2	12	
0	4	9	4	6	2
N=	31	41	39	45	29
Mean	2.52	2.34	3.41	2.15	3.96
S.D.	1.75	2.10	2.05	1.81	1.78
Min.Max.	0-7	0-8	0-8	0-8	0-7

Part two of the test needed finer discrimination since, when alterations occured, they consisted of a quarter-tone up or down.

The mean score obtained from all the schools is lower than 50% of the total (10). Boys are better than girls in both groups. However, this part is more difficult than the first part and the histograms are strongly skewed.

Cattell Culture Fair Test: Scale II.

No printed instructions for the four subtests provided on the answer sheet or test booklet. However, the

Figure (15)

Interval Recognition (Oriental Items)

General Preparatory Schools

N = 111

National Conservatory

N = 74

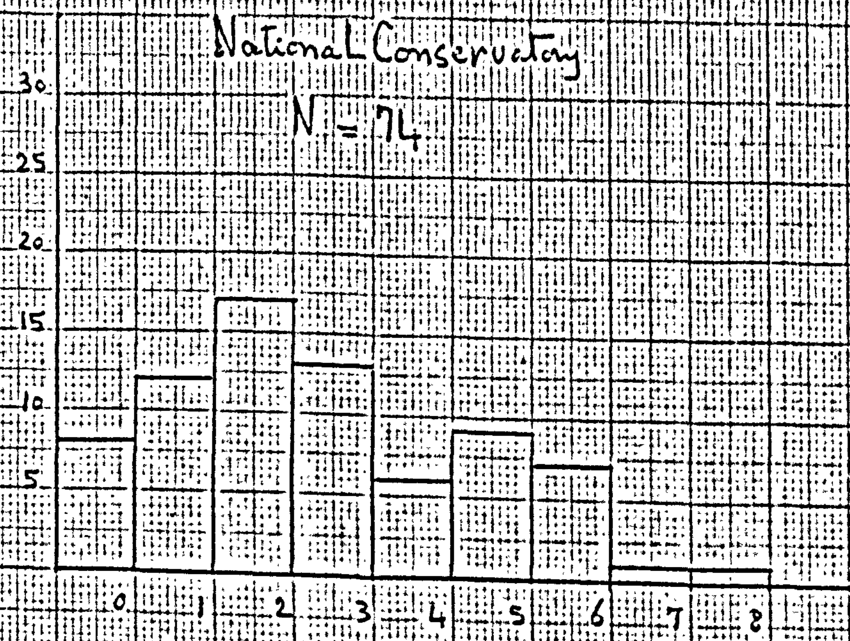
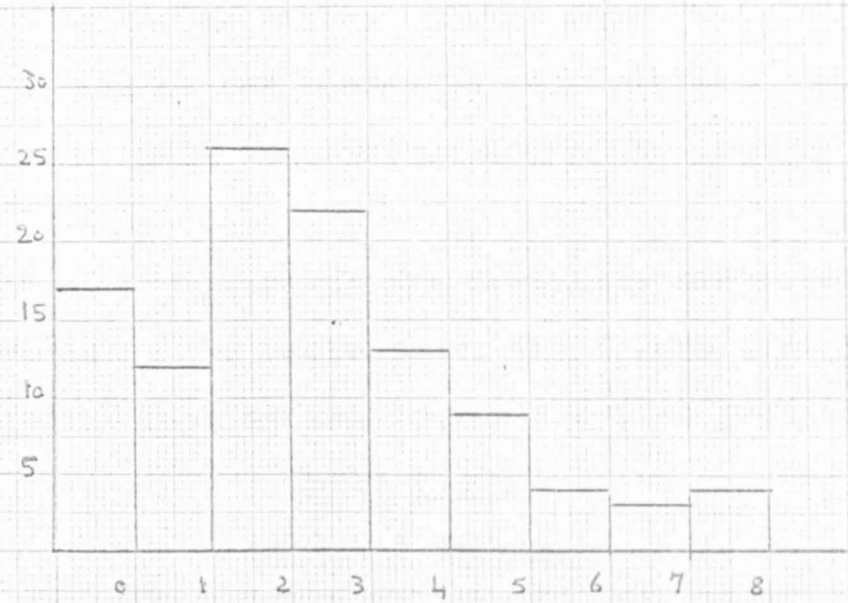


Figure (15)

Internal Recognition (Oriental Items)

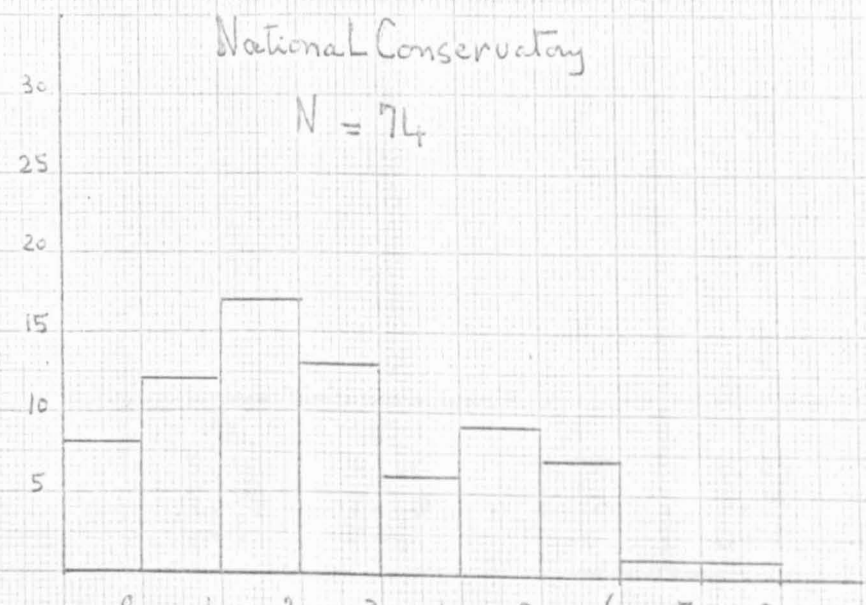
General Preparatory Schools

N = 111



National Conservatory

N = 74



instructions which have been published in the 1959 manual were followed carefully and translated into Arabic. These were given to the subjects orally, and the sample items were explained.

The following tables (53-56) show, the frequency distribution of raw scores in each subtest, means, S.D. and minimum and maximum score obtained by each group.

Table (57) presents the frequency distribution of raw scores in the whole test, and figure (16) illustrates the distribution of the scores for both groups.

Table (53).

IPAT : I Series.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
10-1	1			1	
9	1	3	2	8	3
8	2	4	5	6	5
7	7	4	8	2	3
6	6	12	3	5	7
5	6	8	7	5	1
4	4	4	4	2	
3	3	2	5	4	2
2	2	1	3		3
1		1	2	4	3
0		2		8	2
N=	31	41	39	45	29
Mean	5.45	5.46	5.28	4.93	5.17
S.D.	1.78	2.18	2.25	3.35	2.95
Min.Max.	2-9	0-9	1-9	0-10	0-9

Table (54)

IPAT : 2 : Classification

Interval	General Preparatory Schools			National Conservatory	
	Sch. I Girls	Sch. II Girls	Sch. III Boys	Girls	Boys
9		2	1	6	2
8	5	1	1	4	1
7	3	8	5	6	5
6	10	13	8	5	5
5	5	9	11	7	6
45	5	2	6	7	3
3	1	3	4	2	3
2	2	3	1	2	1
1			2	5	2
0				1	1
N	31	41	39	45	29
Mean	5.58	5.56	5.00	5.22	5.03
S.D.	1.67	1.69	1.75	2.57	2.29
Min. Max.	2-8	2-9	1-9	0-9	0-9

Table (55)

IPAT : 3 : Matrices

Interval	General Preparatory Schools			National Conservatory	
	Sch. I Girls	Sch. II Girls	Sch. III Boys	Girls	Boys
9	1	3	2	9	7
8	1	5	6	5	2
7	5	2	4	3	1
6	5	5	3	4	4
5	6	12	7	6	4
4	6	11	7	2	1
3	6	2	6	7	2
2			3	4	4
1	1	1		2	2
0			1	3	2
N	31	41	39	45	29
Mean	5.00	5.41	5.10	5.24	5.17
S.D.	1.79	1.83	2.22	2.88	3.07
Min. Max.	1-9	1-9	0-9	0-9	0-9

Table (56)

IPAT : 4 : Conditions.

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
8		1		5	2
7	2	2	2	4	2
6		4	8	2	8
5	7	9	14	8	4
4	7	9	3	8	3
3	6	7	3	3	4
2	5	6	7	4	
1	4	2	2	7	1
0		1		4	5
N=	31	41	39	45	29
Mean	3.52	3.95	4.54	4.00	4.28
S.D.	1.63	1.76	1.90	2.63	2.58
Min.Max.	1-7	0-9	1-7	0-8	0-8

Table (57)

IPAT : Total

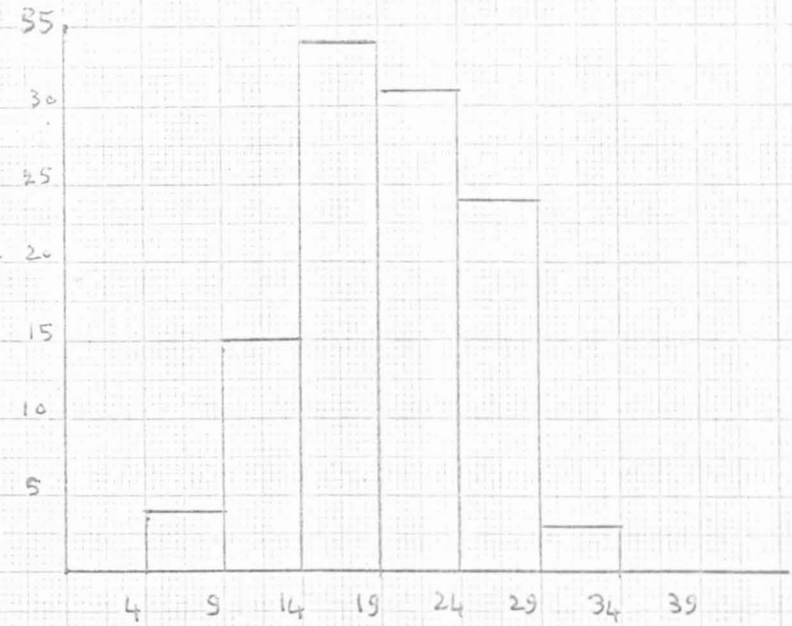
Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
35-39				2	1
30-34	1	1	1	6	1
25-29	5	7	12	8	9
20-24	9	15	7	6	7
15-19	12	12	10	10	3
10-14	4	4	7	6	3
5-9		2	2	2	2
0-4				5	3
N=	31	41	39	45	29
Mean	19.54	20.39	19.92	19.40	19.65
S.D.	5.03	5.23	6.46	9.85	9.24
Min.Max.	10-32	8-32	6-31	1-36	2-36

Figure (16)

Cattell IPAT Scale II

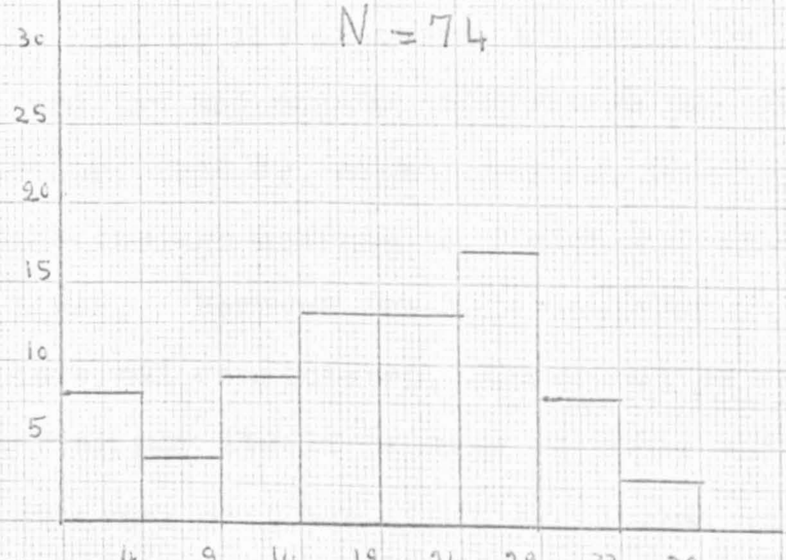
General Preparatory Schools

N = 111



National Conservatory

N = 74



The distributions of scores as presented in this table and the following histograms are nearly normal except for the Boys in the N.C. Thus the test was appropriate in level of difficulty, except for some of the younger N.C. subjects. There are no great differences between the different groups as the difference between the highest mean score (20.39) obtained by the School 2 and the lowest (19.40) obtained by the Gitls from N.C. is only (.99).

In validating musical ability tests, the authors of the tests or the test users, have used various techniques. Authors such as Seashore and his colleagues did not use any external criterion and were sharply criticized by others such as Mursell (1937). Mursell stated that "there is only one satisfactory method of finding out whether Seashore tests really measure musical ability, and that is to ascertain whether persons rating high or low or medium on these tests also rate high and low and medium in what one may call musical behaviour, that is, sight singing, playing the piano, getting through courses in theory and applied music and the like". However Seashore insisted on using logical and internal consistency, since he believes that an external criterion may itself be less reliable than the test. The external criteria used by several investigators are:

1) Teacher's ratings on musical qualities and abilities.

2) Music examinations.

In my opinion, the teachers ratings, although they may be influenced by non-musical factors such as the students co-operation in a certain activity etc., are the most useful criterion in validating a test battery, since the class music teacher can follow the child's progress over an extended period, and ignore other factors which may affect the child's scores in a general examination such as nervousness.

In this study, teacher's marks in Arabic, Mathematics, Performing, sight singing and Music Theory scores, will act as the external criterion after being normalized to a 10-point scale, since considerable differences were found between the standards of assessment in different schools. The following tables (58 to 62) show the frequency distributions of those normalized scores, means, S.Ds, and minimum and maximum scores obtained by each school.

Table (58)

Arabic

Interval	General Preparatory Schools Sch I Girls	Sch II Girls	Sch III Boys	National Conservatory Girls	Boys
9	I	I	I	I	1
8	2	2	I	2	1
7	3	3	3	3	3
6	4	6	6	6	3
5	6	9	8	10	6
4	5	8	8	11	6
3	4	6	6	6	4
2	3	3	3	3	2
1	2	2	2	2	2
0	1	1	1	1	1
N=	31	41	39	45	29
Mean	4.52	4.54	4.41	4.49	4.41
S.D.	2.22	1.98	1.96	1.90	2.13
Min.Max.	0-9	0-9	0-9	0-9	0-9

Table (59)

Mathematics

Interval	General Preparatory Schools Sch I Girls	Sch II Girls	Sch III Boys	National Conservatory Girls	Boys
9	1	1	1	1	1
8	2	2	2	2	2
7	4	3	4	3	3
6	5	6	6	6	4
5	5	9	9	10	6
4	5	8	8	11	6
3	4	6	4	6	3
2	2	3	2	3	2
1	2	2	2	2	1
0	1	1	1	1	1
N=	31	41	39	45	29
Mean	4.71	4.51	4.72	4.53	4.65
S.D.	2.22	1.98	1.99	1.96	2.02
Min.Max.	0-9	0-9	0-9	0-9	0-9

Table (60)

Performing

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
9	1	1	1	1	1
8	2	1	2	2	2
7	2	3	3	3	3
6	5	6	7	6	4
5	6	9	8	11	6
4	6	9	8	10	5
3	5	6	4	6	4
2	2	3	3	3	2
1	1	2	2	2	1
0	1	1	1	1	1
N=	31	41	39	45	29
Mean	4.61	4.41	4.61	4.47	4.72
S.D.	2.06	1.91	2.02	1.90	2.14
Min.Max.	0-9	0-9	0-9	0-9	0-9

Table (61)

Music Theory

Interval	General Preparatory Schools			National Conservatory	
	Sch I Girls	Sch II Girls	Sch III Boys	Girls	Boys
9	1	1	1	1	1
8	1	1	2	2	1
7	3	3	4	4	3
6	5	5	4	6	4
5	6	10	8	10	6
4	6	9	7	11	6
3	5	6	6	6	4
2	2	3	3	2	2
1	1	2	2	2	1
0	1	1	2	1	1
N=	31	41	39	45	29
Mean	4.58	4.39	4.38	4.53	4.59
S.D.	2.01	1.89	2.17	1.83	2.04
Min.Max.	0-9	0-9	0-9	0-9	0-9

Table (62)

Sight Singing.

Interval	General Preparatory Schools Sch. I Girls	Sch. II Girls	Sch. III Boys	National Conservatory Girls	Boys
9	1	1	2	1	1
8	1	1	2	1	2
7	3	3	3	3	3
6	5	5	5	6	4
5	6	9	8	10	5
4	6	10	7	11	5
3	5	6	6	6	3
2	2	3	3	4	3
1	1	2	2	2	2
0	1	1	1	1	1
N	31	41	39	45	29
Mean	4.58	4.37	4.56	4.20	4.55
S. D.	2.01	1.89	2.16	1.76	2.28
Min.-Max	0-9	0-9	0-9	0-9	0-9

The effects of environment on the child's musical abilities:

In previous investigations, the effects of environment have often been studied. In Eastern Countries, the general environment plays particularly important role in the child's behaviour since encouragement or inhibition of certain patterns are entrenched in the traditions of the culture. For example, music was considered a "female" art in the early periods of Islamic Faith. When in the middle ages men started to join the courts as singers, they imitated the women in their singing and voices and were known as "Mokhanathun"(an Arabic word which describes men who behave like women). In Egypt the attitude towards music has changed. In the last century, professionals were considered to be a caste of people who were not respected. They were always members of the lower-middle class. On the other hand, in every house of the "elite" a piano takes its position as an important part of the "furniture". Girls from these families usually learn music privately. The attitude towards music was more favourable among the Copts than the Muslims, possibly because hymns were practised in their churches and accompanied by rhythmic patterns while in the"mosque" no music is allowed, and there are no chants preceding the actual prayers. At the present time a great change in the general attitude towards music has occured. Music became part of the school curriculum since 1937. Music education is moving into a favourable climate, and the government is encouraging the production of musicians. Families are nowadays much less conservative towards the arts especially in the North of the Delta. In Upper Egypt, parents still tend to prefer their children to study the usual subjects rather than spending their time on such arts as music or painting.

In the writer's opinion, musical ability is to some extent an ability without which a suitable environment cannot be effective. But without environmental encouragement in singing, listening to and playing music, a child cannot realise his potential musical abilities.

Information about the general environment, together with the subjects self-ratings of his interests were obtained by a questionnaire designed for this investigation. The information given by each subject included:

1) Age

2) Socio-Economic Status: this was indicated by the father's occupation. A rating was given on a 5-point scale according to the cultural, economic and social status of the father, as follows:

5	points	for	Upper-class
4	"	"	Upper-Middle-Class
3	"	"	Middle-Class
2	"	"	Lower-Middle-Class
1	"	"	Lower-Class

3) Degree of Training: as indicated by the number of years in which music was considered as a special subject.

4) Degree of Interest in Music: as self-rated on a 4-point scale (a) very interested, (b) interested, (c) indifferent, (d) dislike.

5) <u>Musicality of Father, Mother and Siblings</u>: A four-point scale was used to indicate the amount of time the father, mother and siblings spend in playing any musical instrument as follows:

Frequently	Occasionally	Seldom	Never
3	2	1	0

6) <u>Subject's Musical Activity</u>: as shown by membership of orchestral bands at the different stages of education as follows:

University Level
Secondary Level
Preparatory Level
Primary Level

A subject who states that he joined the band at the primary level and missed it at the preparatory level, then joined again at the secondary level will be rated 2 points and so on.

7) <u>Subject's Programme Preference</u>: and amount of listening

	A Western Music	B Oriental Music
2 hours daily	4	4
2 hours fortnightly	3	3
2 hours monthly	2	2
Rarely	1	1
Not interested	0	0

8) Attending Concerts :

Twice a month	4
Once a month	3
Twice a year	2
Once a year	1
Never	0

9) Preference for Music Played in Leisure Time:

Oriental
1 or 0

Western
1 or 0

10) Family Encouragement: the degree of encouragement given by the subject's family is difficult to rate. The criterion adopted was to ask the child 'who encourages you to play an instrument at home?' One point was given for each member such as father, mother and sibling(s).

The answers obtained from the childrens group in this study (n=185 children with age range between 9 years+ to 15 years+ were analysed. The following tables show the results.

Table (63) AGE

Schools	General Preparatory Schools			N. C.	
	Girls	Girls	Boys	Girls	Boys
Age Range	12y-15y	12y-15y6m	12y-15y	9y-16y	9y-15y
Mean*	26.67	27.22	26.85	25.11	22.48
S.D.	1.97	2.04	1.80	4.68	2.90

*One point is given for each 6 months e.g. a child aged twelve years and three months is given a score of 24.

Table (64)

Socio-Economic Status.

SCHOOLS	GENERAL PREPARATORY SCHOOLS			N.C.	
	GIRLS	GIRLS	BOYS	GIRLS	BOYS
Range	2-4	1-4	1-4	2-5	2-5
Mean	2.94	2.46	2.38	3.47	3.62
S.D.	0.57	0.84	0.81	0.73	0.82

Table (65)

Degree of Training.

SCHOOLS	GENERAL PREPARATORY SCHOOLS			N.C.	
	GIRLS	GIRLS	BOYS	GIRLS	BOYS
Grades[x]	5-7	5-7	5-7	2-7	2-7
Mean	5.52	5.73	5.85	3.84	3.07
S.D.	0.81	0.81	0.78	1.86	1.33

As mentioned above, the educational scheme in Egypt follows four stages Primary 6+ to 12+ (6 grades).
Preparatory 12+ to 15+ (3 grades).
Secondary 15+ to 18+ (3 grades).
University 18+ to 22+ (4 to 5 grades).

In this study children were selected from all the preparatory grades, and from the 3 upper grades of the primary stage and their degree of training was rated as follows:

Table (66)

	Primary			Preparatory		
Grade	A	B	C	1	2	3
Points	2	3	4	4	5	6

Table (67)

Degree of Interest in Music.

Degree of Interest	Sch. I	Sch. 2	Sch. 3	N.C. Girls	N.C. Boys
V. Interested	12	29	13	24	15
Interested	16	10	19	18	14
Indifferent	3	2	7	3	-
Dislike	-	-	-	-	-
Mean	3.29	3.66	3.15	3.47	3.52
S.D.	0.64	0.57	0.71	0.62	0.51

Table (68)

Family Musicality

No. of Sets	Sch I	Sch 2	Sch 3	N. C. Girls	N. C. Boys
Father only	-	-	1	4	3
Mother only	-	-	1	5	4
Sibling only	4	11	11	2	3
Father and Mother	-	1	1	8	3
Father and Siblings	1	4	1	12	7
Mother and Sib.	-	1	-	5	-
Father, Mother and Sibling	-	1	-	8	6
None	26	23	24	1	3

From the above table (68) it is clear that the families of the N.C. subjects tend to be more musical. In contrast 73 out of 111 families in the G.P.S. are quite unmusical and in only one family out of 111 do all the members enjoy music. In 14 families out of 74 in the conservatory groups all the family enjoys music, and only in 4 are there no musical relatives.

Here the socio-economic status can play an important influence since most of the subjects of the N.C. are from Upper-Middle-class (mean 3.47 for girls and 3.62 for boys) while the subjects from the G.P.S. are mostly in the Lower-Middle-class as shown by the mean scores of 2.94, 2.46, and 2.38, for schools 1,2,and 3 respectively. This confirms the suggestion that parents from the middle or lower middle classes may encourage their children to study music, but not to choose music as their career, since in their opinion professional musicians are not respected by the community. While the "elite" and upper middle class regard music as a fine art and may choose this career for their children if they show the necessary ability. Hence they let them start serious music education at an earlier age.

Table (69)

<u>Musical Activity.</u>

Subjects Joining Bands in	G. P. S.			N. C.	
	Sch. 1	Sch. 2	Sch. 3	Girls	Boys
Primary and Prep.	2	12	14	8	4
Primary or Prep.	17	17	23	18	15
None	12	12	2	19	10
Mean	0.68	1.00	1.31	0.76	0.72
S.D.	0.60	0.77	0.57	0.71	0.60

According to the criterion of joining, the school bands the G.P.S. subjects show more musical activity than the N.C. subjects. The reason for this is that in each G.P.S. school there is a musical band to join and this activity is stressed by the Ministry of Education. On the other hand, the subjects of the N.C. come from different schools and only join it on certain days of the week for this special instruction. The Conservatory is not responsible for the bands in the subjects' schools. Another point is that most of the N.C. subjects join private schools not state schools which are under the Ministry of Education supervision, and the curriculum and other activities in the private schools are provided by the Board of each school.

Table (70)

Preference of Programs

Pref of Programs	G. P. S.			N.C.	
	Sch 1	Sch 2	Sch 3	Girls	Boys
W. Progs.only	-	-	-	9	10
O. Progs.only	10	16	9	-	1
Both	21	25	30	36	18
Mean : Pref. of W.	1.20	1.46	1.92	2.02	2.93
Mean : Pref. of O.	3.16	3.51	3.23	2.90	1.83

From table (70) it is noticed that subjects of N.C. either prefer to listen to both kind of programmes, i.e. programmes concerned with Western as well as oriental, or to Western. Only one subject is interested to hear oriental-music programmes. On the other hand subjects from G.P.S. either prefer both or oriental music only. This difference in preference is due to one or both of the following factors.

1) Socio-economic factor: in this respect, families with higher social status can afford to buy records either of occidental or oriental music, and the child can listen to both programmes. While subjects with middle or lower middle social status may only listen to music programmes from the radio in which most programmes are concerned with the national type of music. The acquaintance of the subject with Western music will be only through the school in which he is presented with Western music for his piano or violin repertoire.

2) Cultural Factor: Families of higher social status are also likely to be more cultured generally and to be interested in hearing Western music. They will encourage their children if they show any interest in listening to music which means nothing to the wider community. In lower class homes where there is no interest in such music, the child will be inhibited and not given the chance for real appreciation of the art. Both leisure time activity and attending concerts are influenced by these two factors.

Table (71)

Attending Concerts

Number of Times		G. P. S.		N. C	
	Sch I	Sch 2	Sch 3	Girls	Boys
Twice a Month	-	-	1	4	7
Once a Month	2	-	1	17	8
Twice a year	1	-	1	17	11
Once a year	23	6	6	7	3
Never	5	35	30	-	-
Mean	1.00	.15	38	2.38	2.65

Table (72)

Leisure Time Activity.

Preference	G. P. S.			N. C.	
	Sch 1	Sch 2	Sch 3	Girls	Boys
Oriental	18	9	19	10	8
Western	-	2	2	26	12
Both	10	29	13	9	6
None	3	1	2	-	3
$Mean_O$	.90	.93	.90	.42	.48
$Mean_W$	.32	.76	.38	.78	.62

Table (73)

Family Encouragement

Degree of Encouragement	G. P. S.			N. C.	
	Sch 1	Sch 2	Sch 3	Girls	Boys
All Members of Family	1	15	7	20	11
Two Members of Family	11	10	14	25	18
One Member of Family	10	13	3	-	-
None	9	2	15	-	-
Mean	1.19	1.90	1.33	2.42	2.30

It is noticed that the children of the N.C. are more encouraged to study music than those of the G.P.S.

Some general conclusions arising from the above analysis are:-

1. Children of higher social and economic status in Egypt are more encouraged to study music by their parents.
2. When parents are interested in music, children are more musical which suggests that musical ability is probably innate.
3. There is an indication in table (68) that father's musicality affects the children's musicality more than the mother's. This may be because the father's status is more important in the community.
4. At the age under discussion 9 to 15+ children seem to be interested in music and if encouraged, this may affect their musical sensitivity.

COMPARISON BETWEEN THE TWO CHILDRENS GROUPS

From the questionnaire analysis, it is apparent that the N.C. subjects are more favoured than the G.P.S. subjects and their musical environment is superior. But how much does this favourable environment or their superior inherited talent affect the children's performance in aptitude tests? For this purpose of comparison the two sexes are combined. The difference between the groups means in each test and its significance was calculated by the formula:

$$\sigma D = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \qquad (1)$$

$$CR = \frac{M_1 - M_2}{\sigma D} \qquad (2)$$

Where:

σD = Standard error of uncorrelated means
σ_1 = Standard Deviation of group I
σ_2 = Standard Deviation of Group 2
N_1 = Number of Subjects in Group I
N_2 = Number of Subjects in Group 2
C.R. = Critical Ratio or the Ratio for a difference between means

The difference between the means will be significant

1. at the .05 level when the CR is 1.96 or greater;
2. at the .02 level when the CR is 2.33 or greater; and
3. at the .01 level when the CR is 2.58 or greater.

(Garrett 1967, p. 213)

Table (74) gives the mean and S.D. of raw scores for each school separately and table (75) gives the mean and S.D. of raw scores for the younger and older subjects of the N.C. group The latter was especially calculated since the N.C. group contains 9-11 year olds in grades A,B, and C and 12 tp 15 year olds in grade 1-3, and it is only the latter subgroup who can be compared with the 12-15 year olds in the G.P.S. Table (76) shows the differences between the means of the raw scores of the subjects with age range of 12-15+ in the G.P.S. and the N.C. groups. When the G.P.S. means were compared with the means for all the N.C. children, there were few significant differences because the latter included so many younger children. Hence in the detailed discussions of the results, table (76) will be our reference. A further discussion of the differences between the younger and older subjects within the N.C. group will follow below.

As may be seen from table (76), the N.C. subgroup were superior in both the Seashore and the Bentley test batteries. The superiority or inferiority in individual tests will follow below.

A: <u>The Pitch Tests:</u>

In the Seashore Pitch test the difference between

Table (74)

	Variable	General Preparatory Schools			
		Sch. I Girls		Sch. II Girls	
		Mean	S. D.	Mean	S. D.
1	Seashore Pitch	26.61	6.01	24.05	7.39
2	Rhythm	24.26	3.84	23.90	3.66
3	Time	31.45	6.81	33.92	5.41
4	Tonal Memory	13.58	4.57	14.39	6.84
5	Total	95.97	13.66	96.27	17.68
6	Bentley Pitch	4.97	2.44	9.93	4.73
7	Tonal Memory	3.26	2.32	5.05	2.65
8	Choral Analysis	6.42	2.61	8.90	3.64
9	Rhythmic Memory	6.00	1.59	7.71	1.12
10	Total	21.45	6.33	31.58	9.20
11	SADek Melody Identification	16.35	2.48	14.49	3.38
12	" Rhythmic Identification	13.74	2.94	12.15	4.50
13	" Interval Rec. Total	20.13	4.21	22.56	3.67
14	" " " Oriental	2.52	1.75	2.34	2.10
15	Cattell Series	5.45	1.78	5.46	2.18
16	Classifications	5.58	1.67	5.56	1.69
17	Matrics	5.00	1.79	5.41	1.83
18	Conditions	3.52	1.63	3.95	1.76
19	Total of Scores	19.54	5.03	20.39	5.23
20	Achievement: tests: Arabic	4.52	2.22	4.54	1.98
21	Mathematics	4.71	2.22	4.51	1.98
22	Performing	4.61	2.06	4.41	1.91
23	Music Theory	4.58	2.01	4.39	1.89
24	Sight Singing	4.58	2.01	4.37	1.89
25	Questionaire Analysis: Age	26.67	1.97	27.22	2.04
26	Socio-Economic Status	2.94	0.57	2.46	0.84
27	Degree of Training	5.52	0.81	5.73	0.81
28	Degree of Interest	3.29	0.64	3.66	0.57
29	Musicality of Fathers	0.13	0.72	0.36	1.02
30	" " Mothers	0.00	0.00	0.17	0.77
31	Musical Activity	0.68	0.60	1.00	0.77
32	Preference of Oriental Prog.	3.16	0.52	3.51	0.55
33	Preference of Western Prog.	1.20	1.17	1.46	1.38
34	Attending Concerts	1.00	0.68	0.15	0.36
35	Leisure Time Activity Oriental	0.90	0.30	0.93	0.26
36	" " " Western	0.32	0.48	0.76	0.43
37	Family Encouragement	1.19	0.87	1.90	0.99
38	Sibling Musicility	0.35	1.14	1.58	2.07
39	Total of Achievement tests	23.00	5.87	22.22	7.72
40	Interval Recognition Western	17.61	3.27	20.19	2.58

Table (74)

	Variable	General Preparatory Schools			
		Sch. I Girls		Sch. II Girls	
		Mean	S. D.	Mean	S. D.
1	Seashore Pitch	26.61	6.01	24.05	7.39
2	Rhythm	24.26	3.84	23.90	3.66
3	Time	31.45	6.81	33.92	5.41
4	Tonal Memory	13.58	4.57	14.39	6.84
5	Total	95.97	13.66	96.27	17.68
6	Bentley Pitch	4.97	2.44	9.93	4.73
7	Tonal Memory	3.26	2.32	5.05	2.65
8	Choral Analysis	6.42	2.61	8.90	3.64
9	Rhythmic Memory	6.00	1.59	7.71	1.12
10	Total	21.45	6.33	31.58	9.20
11	SADek Melody Identification	16.35	2.48	14.49	3.38
12	" Rhythmic Identification	13.74	2.94	12.15	4.50
13	" Interval Rec. Total	20.13	4.21	22.56	3.67
14	" " " Oriental	2.52	1.75	2.34	2.10
15	Cattell Series	5.45	1.78	5.46	2.18
16	Classifications	5.58	1.67	5.56	1.69
17	Matrics	5.00	1.79	5.41	1.83
18	Conditions	3.52	1.63	3.95	1.76
19	Total of Scores	19.54	5.03	20.39	5.23
20	Achievement: tests: Arabic	4.52	2.22	4.54	1.98
21	Mathematics	4.71	2.22	4.51	1.98
22	Performing	4.61	2.06	4.41	1.91
23	Music Theory	4.58	2.01	4.39	1.89
24	Sight Singing	4.58	2.01	4.37	1.89
25	Questionaire Analysis: Age	26.67	1.97	27.22	2.04
26	Socio-Economic Status	2.94	0.57	2.46	0.84
27	Degree of Training	5.52	0.81	5.73	0.81
28	Degree of Interest	3.29	0.64	3.66	0.57
29	Musicality of Fathers	0.13	0.72	0.36	1.02
30	" " Mothers	0.00	0.00	0.17	0.77
31	Musical Activity	0.68	0.60	1.00	0.77
32	Preference of Oriental Prog.	3.16	0.52	3.51	0.55
33	Preference of Western Prog.	1.20	1.17	1.46	1.38
34	Attending Concerts	1.00	0.68	0.15	0.36
35	Leisure Time Activity Oriental	0.90	0.30	0.93	0.26
36	" " " Western	0.32	0.48	0.76	0.43
37	Family Encouragement	1.19	0.87	1.90	0.99
38	Sibling Musicility	0.35	1.14	1.58	2.07
39	Total of Achievement tests	23.00	5.87	22.22	7.72
40	Interval Recognition Western	17.61	3.27	20.19	2.58

Table (74) continued

	Sch. III Boys		National Conservatory			
			Girl's		Boys	
	Mean	S. D.	Mean	S. D.	Mean	S. D.
1	27.92	7.11	28.98	10.78	29.45	10.22
2	25.49	3.02	24.89	5.36	24.83	4.39
3	36.23	6.54	30.31	7.02	32.00	6.18
4	18.08	5.26	19.13	8.83	18.79	7.49
5	107.69	14.04	103.29	25.89	105.17	19.37
6	12.38	3.42	10.36	4.97	10.24	6.68
7	6.33	1.96	5.69	2.64	6.69	3.06
8	8.90	3.13	8.38	3.91	9.17	4.23
9	7.87	1.89	6.15	2.04	6.48	2.28
10	35.49	7.09	30.58	10.59	32.24	11.60
11	16.05	3.25	17.60	3.20	19.93	4.87
12	10.74	5.06	16.96	5.60	15.17	5.40
13	26.92	3.46	22.82	5.80	26.48	6.11
14	3.41	2.05	2.15	1.81	3.96	1.78
15	5.28	2.25	4.93	3.35	5.17	2.95
16	5.00	1.75	5.22	2.57	5.03	2.29
17	5.10	2.22	5.24	2.88	5.17	3.07
18	4.54	1.90	4.00	2.63	4.28	2.58
19	19.92	6.46	19.40	9.85	19.65	9.24
20	4.41	1.96	4.49	1.90	4.41	2.13
21	4.72	1.99	4.53	1.96	4.65	2.02
22	4.61	2.02	4.47	1.90	4.72	2.14
23	4.38	2.17	4.53	1.83	4.59	2.04
24	4.56	2.16	4.20	1.76	4.55	2.28
25	26.85	1.80	25.11	4.68	22.48	2.90
26	2.38	0.81	3.47	0.73	3.62	0.82
27	5.85	0.78	3.84	1.86	3.07	1.33
28	3.15	0.71	3.47	0.62	3.52	0.51
29	0.15	0.59	1.33	1.07	1.31	1.20
30	0.08	0.35	1.10	1.14	0.52	0.63
31	1.31	0.57	0.76	0.71	0.72	0.60
32	3.23	0.71	2.02	1.40	1.83	1.07
33	1.92	1.51	2.90	1.05	2.93	0.92
34	0.38	0.88	2.38	0.86	2.65	0.97
35	0.90	0.31	0.42	0.50	0.48	0.51
36	0.38	0.49	0.78	0.42	0.62	0.49
37	1.33	1.18	2.42	0.50	2.38	0.49
38	0.90	1.45	2.18	2.54	1.90	2.35
39	22.69	8.22	22.22	5.53	23.07	8.18
40	23.51	3.00	20.71	5.04	22.59	5.49

Table (75)

Means and S.D. of Raw Scores Obtained by The Different Sub-groups of the N.C. Children

Variables	Girls		Boys		Girls		Boys		Girls + Boys		Girls + Boys	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
1 Seashore Pitch	22.60	8.90	27.11	10.35	33.72	10.55	33.36	7.40	24.74	7.95	33.61	10.55
2 Rhythm	22.85	4.06	23.38	3.78	26.28	4.78	27.18	2.52	23.11	4.21	26.56	4.72
3 Time	29.60	7.10	31.38	6.45	30.68	6.20	33.09	6.00	30.45	7.00	31.42	6.25
4 Tonal Memory	14.10	7.89	17.67	6.75	27.16	7.26	22.00	7.29	15.66	7.92	22.81	6.39
5 Total	90.40	18.60	99.33	18.20	114.04	24.90	114.72	15.80	94.63	20.20	114.25	19.90
6 Bentley Pitch	7.80	4.98	7.94	5.86	12.60	3.84	14.36	5.62	7.96	5.48	13.14	4.50
7 Tonal Memory	5.45	2.89	5.61	3.00	7.28	2.47	8.45	2.13	5.53	2.47	7.64	1.97
8 Chord Analysis	8.30	4.12	8.17	4.20	8.76	4.18	10.81	3.54	8.24	4.02	9.39	4.06
9 Rhythmic Memory	6.10	2.10	5.67	2.33	6.32	1.91	7.82	1.19	5.89	2.22	5.78	2.15
10 Total	28.25	10.40	27.16	9.60	34.96	10.50	40.55	9.60	27.74	10.10	36.67	7.00
11 Sadek Melody Ident.	16.40	2.40	19.00	5.20	19.00	3.68	21.45	3.66	17.63	4.20	19.75	3.70
12 Rhythmic Ident.	15.00	6.04	11.11	4.60	18.88	4.80	18.18	5.22	13.16	5.50	18.67	5.02
13 Interval Recog. T	22.30	5.55	25.83	4.89	23.48	5.67	27.54	4.32	23.97	5.46	24.72	5.64
14 Interval Recog. O	1.75	1.38	3.67	2.03	2.52	2.14	4.27	.27	2.66	1.99	3.06	1.84
15 Interval Recog. W	20.55	2.34	22.17	2.76	21.04	2.54	23.27	2.04	21.32	2.48	21.72	2.48
16 Cattell Series	2.95	3.23	4.22	2.93	6.60	1.30	6.73	1.76	3.55	3.20	6.64	2.23
17 Classifications	4.05	2.46	4.28	1.73	6.20	2.32	6.27	2.46	4.16	2.08	5.89	2.36
18 Matrices	4.00	2.71	4.83	3.16	6.24	2.59	5.73	2.67	4.39	2.97	6.08	2.64
19 Conditions	2.30	1.89	3.77	2.49	5.36	2.13	5.09	2.32	2.95	2.33	5.28	2.22
20 Total	13.20	8.20	17.11	8.60	24.40	8.65	23.82	9.95	15.05	8.60	24.22	8.05
21 Achievement Arabic	3.50	1.75	4.83	1.72	5.28	1.59	5.46	2.01	3.63	1.74	5.33	1.81
22 Mathematics	3.70	1.58	4.39	2.14	3.92	1.70	5.36	1.78	4.03	1.90	4.36	1.85
23 Performing	3.50	1.69	4.39	2.01	5.32	1.62	5.64	1.92	3.92	1.88	5.42	1.72
24 Music Theory	4.00	1.23	4.33	2.46	5.08	2.15	5.00	1.65	4.16	1.71	5.06	1.72
25 Sight Singing	3.95	1.80	4.28	2.37	4.64	1.80	5.36	1.36	4.11	2.09	4.86	1.81
26 Total	18.10	5.65	20.72	7.50	25.44	4.50	26.90	7.10	19.37	6.05	25.89	6.90
27 Questionnaire Age	20.80	.52	21.11	.56	27.96	.58	24.73	2.96	20.94	0.54	26.97	3.24
28 Socio-Economic Stat.	3.50	.86	3.44	.83	3.40	.64	3.91	.67	3.47	.85	3.55	.67
29 Degree of Training	2.10	.64	2.22	.71	5.20	.80	4.45	.78	2.15	.71	4.97	.90
30 Degree of Interest	3.60	.5[illegible]	3.44	.45	3.20	.63	3.63	.52	3.52	.55	3.33	.60
31 Father's Musicality	1.40	0.97	1.50	1.11	1.32	1.20	1.00	1.70	1.44	1.14	1.22	1.08
32 Mother's Musicality	1.10	1.30	.67	.67	1.00	1.17	.27	.44	.89	1.06	.77	1.02
33 Sibling's Musicality	2.35	2.43	1.72	1.34	2.20	2.59	1.90	1.93	2.05	2.49	2.11	2.40
34 Musical Activity	.40	.58	.61	.59	1.05	.72	1.09	.67	.50	.60	1.05	.70
35 Pref. of O. Prog.	2.55	1.25	1.83	1.07	1.76	1.34	1.63	1.29	2.21	1.22	1.72	1.26
36 Pref. of W. Prog.	2.70	1.05	3.00	.95	3.00	.98	2.81	.84	2.82	1.01	2.94	.93
37 Attending Concerts	2.40	.86	2.61	.36	2.40	.82	2.72	.75	2.50	.96	2.50	.84
38 Leis. time Activity O.	.55	.50	.55	.50	.32	.47	.36	.40	.55	.50	.33	.48
39 Leis. time Activity W	.70	.46	.55	.50	0.80	.37	.72	.37	.63	.48	.80	.38
40 Family Encouragement	2.50	.50	2.39	.49	3.00	.59	2.36	.49	2.44	.50	2.38	.50
N=	20		18		25		11		38		36	
Grades	A+B+C		A+B+C		1+2+3		1+2+3		A+B+C		1+2+3	
Range of Age	9+ to 11+		9+ to 11+		12 to 15+		12 to 15+		9+ to 11+		12 to 15+	

Table (76)
The Difference Between The Means of The Raw Scores and Its Degree of Significance

Veriables	G.P.S. N = 111 Mean	G.P.S. N = 111 S. D.	N. C. N = 36 Mean	N. C. N = 36 S. D.	Difference Between Means	C.R.	Degree of Significance	Counted for G.P.S.	Counted for N.C.
1 Seashore Pitch	26.13	7.07	33.61	10.55	7.58	3.97	at .01 Level		✓
2 Rhythm	24.56	3.54	26.56	4.72	2.00	2.33	at .02 Level		✓
3 Time	34.04	6.45	31.42	6.25	2.62	2.18	at .05 Level	✓	
4 Tonal Memory	15.46	6.01	22.81	6.39	7.35	6.07	at .01 Level		✓
5 Total	100.20	16.23	114.25	19.90	14.05	3.84	at .01 Level		✓
6 Bentley Pitch	9.40	4.75	13.14	4.50	3.74	4.30	at .01 Level		✓
7 Tonal Memory	5.00	2.62	7.64	1.97	2.64	6.44	at .01 Level		✓
8 Chord Analysis	8.21	3.37	9.39	4.06	1.18	1.59	Not Signific		
9 Rhythmic Memory	7.29	1.95	6.78	2.15	.51	1.27	Not Signific		
10 Total	30.13	9.56	36.67	7.00	6.54	4.44	at .01 Level		✓
11 Sadek Melody Ident.	15.56	3.20	19.75	3.70	4.19	6.07	at .01 Level		✓
12 Rhythmic Ident.	12.10	4.47	18.67	5.02	6.57	6.98	at .01 Level		✓
13. Interval Recog. T.	23.41	4.64	24.72	5.64	1.31	1.27	Not Signific		
14 " " O.	2.77	2.03	3.06	1.84	.29	1.80	Not Signific		
15 " " W.	20.64	3.75	21.72	2.48	1.08	1.96	at .05 Level		✓
16 Cattell Series	5.40	2.10	6.64	2.23	1.24	2.95	at .01 Level		✓
17 Classifications	5.37	1.71	5.89	2.36	.52	1.23	Not Signific		
18 Matrices	5.20	1.96	6.08	2.64	.88	1.96	at .05 Level		✓
19 Conditions	4.04	1.80	5.28	2.22	1.24	3.02	at .01 Level		✓
20 Total	20.00	5.60	24.22	8.05	4.22	2.93	at .01 Level		✓
21 Achievement Arabic	4.50	2.03	5.33	1.81	.83	2.30	at .05 Level		✓
22 Mathematics	4.64	2.04	4.36	1.85	.28	0.77	Not Signific		
23 Performing	4.54	1.98	5.42	1.72	.88	2.59	at .01 Level		✓
24 Music Theory	4.44	2.01	5.06	1.72	.62	1.82	Not Signific		
25 Sight Singing	4.50	2.02	4.86	1.81	.36	1.00	Not Signific		
26 Total	22.60	7.40	25.89	6.90	3.29	2.43	at .02 Level		✓
27 Questionnaire Age	26.94	1.94	26.97	3.24	.03	0.06	Not Signific		
28 Socio. Econ. Stat.	2.57	0.80	3.55	.67	.98	7.53	at .01 Level		✓
29 Degree of Training	5.71	0.80	4.97	.90	.74	4.35	at .01 Level	✓	
30 Degree of Interest	3.38	0.67	3.33	.60	.05	.45	Not Signific		
31 Musicality of Fathers	0.22	0.80	1.22	1.08	1.00	5.26	at .01 Level		✓
32 Musicality of Mothers	0.10	0.51	.77	1.02	.67	3.98	at .01 Level		✓
33 Musicality of Siblings	1.00	1.70	2.11	2.40	1.11	2.64	at .01 Level		✓
34 Musical Activity	1.02	0.70	1.05	.70	.03	.23	Not Signific		
35 Pref. of Orient. Prog.	3.31	0.62	1.72	1.26	1.59	7.22	at .01 Level	✓	
36 Pref. of Western Prog.	1.55	1.40	2.94	.93	1.39	6.95	at .01 Level		✓
37 Attending Concerts	0.47	0.75	2.50	.84	2.03	16.91	at .01 Level		✓
38 Leisure Time Activity O.	0.91	0.30	.33	.38	.58	7.25	at .01 Level	✓	
39 " " " W.	0.50	0.50	.80	.38	.30	3.75	at .01 Level		✓
40 Family Encouragement	1.50	1.07	2.38	.50	.88	6.15	at .01 Level		✓

In this table the comparison is between G.P.S. group and N.C. group for subjects of age range between 12 - 15+.

the scores obtained by the two groups is 7.58 out of a possible 50 in favour of the N.C. group, which is siginificant at the .01 level.

In the Bentley Pitch test, the N.C. group are also superior since they obtained a higher mean score. The difference of 3.74 out of a possible 20 is significant at the .01 level.

These two tests are very similar to each other except for certain respects mentioned above, and the superiority of the N.C. children may be attributed either to genetic factors, or environmental factors, or both.

There are some indication that this trait is inherited Seashore stated that "there is a good evidence that a musical ear, by which we mean primarily an ear with a good sense of pitch, is inherited to a considerable extent, and that with this inheritance follows variability in the tonal capacities which depend upon pitch discrimination, such as tonal memory, the sense of timbre, the sense of consonance, and auditory imagery". (Seashore 1938, p.59)

But the hereditary factor cannot stand alone since without training and stimulation a child with a very high sense of pitch can not develop his potential abilities. On the other hand, environmental factors can also not stand alone since a child without any potential abilities cannot play or sing accurately even if he practices and is encouraged by his family.

B: The Rhythm Tests:

In the Seashore Rhythm test the N.C. group are better than the G.P.S. group. The mean scores obtained are 24.65 and 26.56 with a difference of 2.00 out of a possible 30 in favour of the N.C. group. This difference is significant at the .02 level.

In the Bentley Rhythm test, the G.P.S. obtained a higher mean score, but the difference of .51 in their favour is not significant. However, the mean scores for both the rhythm tests are rather high and the distributions are negatively skewed (see histograms 2 and 14). Hence there is less chance for the more talented subjects to show their superiority. The high performance of oriental subjects relative to that of occidental subjects in the rhythm tests will be confirmed when the raw scores obtained are compared with the test norms below.

C: The Memory Tests:

The mean scores in the Seashore Tonal Memory test were 15.46 and 22.81 with a difference of 7.35 out of a possible 30 in favour of the N.C. group. In the Bentley Tonal Memory Test, the N.C. group scored higher by 2.64 out of a possible 10. In both these tests, the differences are significant at the .01 level in favour of the N.C.

group, and indeed yield higher C.R.s than any other tests except those involving identification. An explanation for this superiority is that like the pitch discrimination tests, tonal memeory tests involves recognition of a difference and memory for the previous stimulus. But the tonal memory is more discriminative, probably because it involves grasping a musical gestalt. Another factor which may lead to the N.C. group's superiority in the memory tests is that the material used as stimuli is in "Western" style i.e. no quarter tones are involved. This is borne out by the N.C. group's preference for Western music is shown in variables 15, 36 and 39.

The Seashore Time Test:

The mean score obtained by the G.P.S. and N.C. groups in the test are 34.04 and 31.42 respectively. The difference of 2.62 out of a possible 50 in favour of the G.P.S. group proved significant at the .05 level. This is the only test in the battery in which the G.P.S. showed superiority. One explanation is that the test is more relevant to the practice of oriental music, which is preferred by the G.P.S. children, than of Western music.

The Bentley Chord Analysis Test:-

The mean score obtained by the two groups are 8.21 and 9.39 with a difference of 1.18 in favour of the N.C. group which is not significant . However, the mean scores obtained by the two groups are less than 50% of the total which may indicate that the test is quite a difficult one, since chords are not used in oriental music, and the subjects would become acquainted with chords only through their piano playing not through ear training.

Comparison Between the Total Scores Obtained by the Two Groups in the Seashore and the Bentley Test Batteries:-

The mean scores obtained by the two groups in the Seashore battery differ 14.05 out of a possible 160, which is significant at the .01 level in favour of the N.C. group.

The difference of 6.54 out of 60 on the Bentley tests in favour of the N.C. group is significant at the .01 level.

Generally in these two aptitude batteries, the more selected and better trained performed ~~the~~ better. In only _____ one test was the less selected superior and in two tests-chord analysis and rhythmic memory-(in the Bentley battery) there was no significant difference.

The New Tests.

a: The Melody Identification Test

In this test, the difference of 4.9 out of a possible 30 in favour of the N.C. group is very large and is significant at the .01 level. To perform this test accurately, two capacities are required, (a) familiarity with music notation, and (b) sight singing ability. In these two capacities the N.C. group is expected to be better since they have all passed grades A,B and C to reach this grades 1to 3 while the G.P.S. subjects in grade "1" have had no previous specialization in music. The N.C. subjects have a further advantage since they proved to be better in pitch discrimination which may be useful in a test where auditory and visual perception are co-ordinated.

b: The Rhythmic Identificaton Test:-

The difference of 6.57 out of a possible 30 in favour of the N.C. group is significant at the .01 level and is the largest difference on any test. This superiority may be due to familiarity with rhythmical notation from better training.

The Interval Recognition Tests:

In the whole test there was a difference of 1.31 in favour of the N.C. group but this is not significant. In part one where "Western" intervals are used the N.C.

group were better and their mean score exceeded that of the G.P.S. group with 1.08 which is significant at the .05 level, but where "oriental" intervals are used the difference of 0.29 was very small. The superiority of the N.C. group on "Western" intervals is consonant with their scores in pitch discrimination and memory which appear to be involved in performing these tests.

The Intelligence Tests:-

In all the four sub-tests of Cattell's IPAT Scale 2, the N.C. group scored higher. The mean score in the whole test is higher by 4.22 out of a favourable 46 which is significant at the .01 level. This superiority in general intelligence may have affected the group's performance in the aptitude tests, but this depends on the extent of correlation between general and musical abilities, which will be considered below.

The Achievement Scores:-

The scores obtained from the different schools have been normalized since there was great differences in standards of marking. Hence no useful comparisons can be drawn. The apparent superiority of the N.C. group in some subjects is due merely to the omission of younger pupils.

The Questionnaire Analysis:-

The significance of the data obtained from the questionnaire is as follows:-

The differences between the means obtained by the two groups were all significant at the .01 level except the case of "age" and the self-ratings for "interest in music" and "musical activity".

The N.C. group is very much superior in

(a) Socio-economic status;
(b) Musicality of fathers,mothers, and sibling;
(c) Preference of Western music;
(d) Attending concerts;
and (e) Family encouragement.

They are also moderately superior in playing Western music in leisure time. These factors are all likely to be associated with each other .

The only factors in which the G.P.S. were significantly superior to the N.C. group are (1) "Degree of Training", one would expect to be in the N.C.'s favour. As mentioned above this may be due to under estimation by the N.C. subjects.

(2) Preference for "Oriental" music programmes.
(3) Play "oriental" music in leisure time.

It is probable that the favourable environment of the N.C. group helped them in developing their potential musical abilities, while the subjects of the G.P.S. group have had to depend to a greater extent on the work they do at school. The greater preference of the N.C. for western music and playing western music at home and their attendance at concerts would help them especially in tests based on western materials, hence they do relatively less well in the Interval Recognition test, part 2, where oriental intervals are used. The G.P.S. group are handicapped since no oriental music instructions is included in the curriculum at this stage of music education, and when superiority occurs in tests based on quarter-tone music it will be all due to individual efforts and individual interests. Oriental music instruction is included only in the secondary stage of education which, in the writer's opinion, is unfortunate. However further discussion of this point will be included below.

Comparison Between Younger and Older Subjects Within the N.C. group.

A comparison between subjects in grades A,B and C, (the younger children) with subjects in grades 1,2 and 3 (the older ones) was useful in indicating the effects of age and training on the performance of musical aptitude tests. It is interesting to notice the close similarities between the subjects in the A,B and C grades and the G.P.S. group. From table (76) and (77) it may be seen that where the G.P.S. are superior, i.e. the Seashore Time Tests, there is no significant difference between the older and younger subjects within the N.C. group. In the difficult test, chord analysis, and interval recognition, both parts,

Table (77)

Difference Between The Means of the Raw Scores Obtained By the Two Sub-groups of the N.C. Children and Its Significance

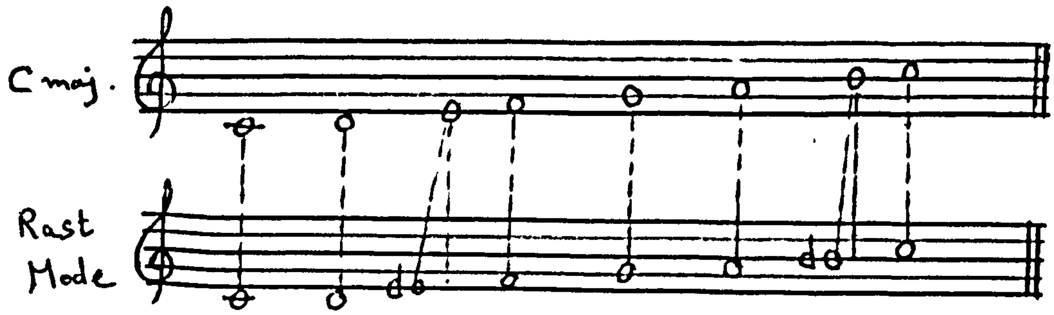
	Variables	Grades A+B+C Mean	Grades A+B+C S. D.	Grades 1+2+3 Mean	Grades 1+2+3 S. D.	Difference Between Mean	C. R.	Degree Of Significance	Counted for A B C	Counted for 1 2 3
1	Seashore Pitch	24.74	7.95	33.61	10.55	8.87	4.71	at .01 Level		✓
2	Rhythm	23.11	4.21	26.56	4.72	3.45	3.31	at .01 Level		✓
3	Time	30.45	7.00	31.42	6.25	0.97	.69	Not Sig.		
4	Tonal Memory	15.66	7.92	22.81	6.39	7.15	4.30	at .01 Level		✓
5	Total	94.63	20.20	114.25	19.90	19.62	4.12	at .01 Level		✓
6	Bentley Pitch	7.96	5.48	13.40	4.50	5.18	4.46	at .01 Level		✓
7	Tonal Memory	5.53	2.47	7.64	1.97	2.11	4.05	at .01 Level		✓
8	Chord Analysis	8.24	4.02	9.39	4.06	1.15	1.22	Not Sig.		
9	Rhythmic Memory	5.89	2.22	6.78	2.15	0.89	1.74	Not Sig.		
10	Total	27.74	10.10	36.67	7.00	8.93	4.44	at .01 Level		✓
11	Sadek Melody Identification	17.63	4.20	19.75	3.70	2.12	2.30	at .05 Level		✓
12	Rhythmic Ident.	13.16	5.50	18.67	5.02	5.51	4.51	at .01 Level		✓
13	Interval Recog. T	23.97	5.46	24.72	5.64	0.75	.58	Not Sig.		
14	Interval Recog. O	2.66	1.99	3.06	1.84	0.40	.88	Not Sig.		
15	Interval Recog. W	21.32	2.48	21.72	2.48	0.40	.69	Not Sig.		
16	Cattell Series	3.55	3.20	6.64	2.23	3.09	4.67	at .01 Level		✓
17	Classification	4.16	2.08	5.89	2.36	1.73	2.88	at .01 Level		✓
18	Matrices	4.39	2.97	6.08	2.64	1.69	2.68	at .01 Level		✓
19	Conditions	2.95	2.23	5.28	2.22	2.33	4.51	at .01 Level		✓
20	Total	15.05	8.60	24.22	8.05	9.17	4.72	at .01 Level		✓
21	Achievement Arabic	3.63	1.74	5.33	1.81	1.70	4.14	at .01 Level		✓
22	Mathematics	4.03	1.90	4.36	1.85	0.33	.76	Not Sig.		
23	Performing	3.92	1.88	5.42	1.72	1.50	3.65	at .01 Level		✓
24	Music Theory	4.16	1.71	5.06	1.72	0.90	2.25	at .05 Level		✓
25	Sight Seeing	4.11	2.09	4.86	1.81	0.75	1.63	Not Sig.		
26	Total	19.37	6.05	25.89	6.90	6.52	4.22	at .01 Level		✓
27	Questionnaire Age	20.94	0.54	26.97	3.24	6.03	10.95	at .01 Level		✓
28	Socio-Econ. Status	3.47	.85	3.55	.67	0.08	.44	Not Sig.		
29	Degree of Training	2.15	.71	4.97	.90	2.82	15.66	at .01 Level		✓
30	Degree of Interest	3.52	.55	3.33	.60	0.19	1.46	Not Sig.		
31	Father's Musicality	1.44	1.14	1.22	1.08	0.22	.70	Not Sig.		
32	Mother's Musicality	.89	1.06	.77	1.02	0.12	.50	Not Sig.		
33	Sibling's Musicality	2.05	2.49	2.11	2.40	0.06	.11	Not Sig.		
34	Musical Activity	.50	.60	1.05	.70	0.55	3.66	at .01 Level		✓
35	Pref. of Orient. Prog.	2.21	1.22	1.72	1.26	0.49	1.69	Not Sig.		
36	Pref. of Western Prog.	2.82	1.01	2.94	.93	0.12	.54	Not Sig.		
37	Attending Concerts	2.50	.96	2.50	.84	0.00	.00	Not Sig.		
38	Leisure Time Activity O.	.55	.50	.33	.48	.22	2.00	at .05 Level	✓	
39	Leisure Time Activity W.	.63	.48	.80	.38	0.17	1.70	Not Sig.		
40	Family Encouragement	2.44	.50	2.38	.50	0.06	.54	Not Sig.		

again no significant differences were found between the older and younger subjects. Also in the Bentley Rhythmic memory test, which proved to be quite easy, no significant differences were found between the groups under discussion. On the other hand, there are big differences on the more musical capacities such as Pitch Discrimination, Tonal Memory and Melody and Rhythm Identification.

In general intelligence, the older children scored more highly and the differences between the means in the 4 sub-tests and the total score are significant at the .01 level.

In achievement tests, the older subjects were superior in Arabic, Performing and Music Theory, but no significant differences are found in mathematics and sight singing.

From the Questionnaire analysis, it is apparent that no significant differences are found in the "general environment" and the subject's "interest in music". But the most interesting point to be noticed is that younger subjects prefer to play oriental music in their leisure time. This seems to be important and confirms the writer's opinion that instruction in oriental music both vocal and instrumental before introducing western instruction may lead to improvements in the general attitude toward oriental music. It is clear that if a child starts his singing with the western C major scale, this will affect the singing of the "Rast" mode which includes Ed and Bd i.e. (the sign "d" = half a flat and is used to flatten a quarter-tone in oriental music).



The introduction of modes and songs involving quarter-tone music at an advanced stage will be much more difficult with children who are accustomed to hearing and singing melodies or songs which do not include quarter-tones. Similarly occidental subjects are handicapped when asked to produce or to sing a scale which includes quarter-tones.

To Sum Up

1. It is found that age, training, and intelligence affect the childrens performance in musical ability tests.

2. A child from a favourable environment has a better chance to develop his potential musical abilities than those who have the same potentialities with a less favourable environment.

3. The children may be divided into three groups

according to their performance on most of the tests in the battery as follows:-

Top: N.C. subjects in grades 1,2, and 3.
Middle: G.P.S. subjects in grades 1,2, and 3.
Lower: N.C. subjects in grades A,B, and C

However there are some variations on particular tests; for example the Top group shows little difference from the others, or may be even inferior, on measures of interest, or ability in oriental music, and on tests such as Sense of Time which do not involve musical material.

Musical Ability and Sex Differences

Different views have been expressed concerning the effects of sex on musical ability tests, partly because different investigators have used different tests of musical ability and studied different ranges of age and training. However these views could be summarized as follows:-

1. Investigations carried out by Wing and Bentley suggested that there are no significant differences between the sexes. Hence they provided combined sex norms for their tests. Seashore and his colleagues (1960) reported that "sex differneces were found to be inconsistent from one level to another" and for the same reason, combined sex norms are given in the manual for their tests.

2. Other researches such as those carried out by Smith (1914), Vance (1914), Kwalwasser (1935), and Semeonoff (1940) indicated that in some tests girls are superior to boys and vise versa. This may arise from the different interests of boys and girls.

3. Gilbert (1942) found that female subjects were generally superior to males but attributed this to the training effect, since when he compared untrained members of the two sexes the difference disappeared. Other investigators such ad Marrowitz (1935) and Woods and Martin (1943) who used the K-D test-battery also reported that girls were superior to boys.

4. In Germany, the extensive studies carried out by Heacker and Ziehen (In Wing1948), suggested that boys are more musical than girls.

When considering these results, we must take into account other factors which may affect test performance such as differences in interests, differences in musical knowledge, motivation and environmental effects. A true comparison could only be made when these factors are eliminated and this can only occur when "the two sexes have equal opportunity and equal motivation to achieve in arts.... then will the comparison have real meaning". (Farnsworth 1958 p. 190).

On the following pages, the differences between the two sexes within the G.P.S. and the N.C. groups will be discussed separately.

1. <u>The General Preparatory School Group</u>:-

This group consists of 111 subjects with age range between 12 to 15+ who have been chosen to study music as a special subject beside their general instructions. There are 72 girls who are from two different schools and 39 boys from one school. All the subjects are selected from grades 1,2 and 3 and, as can be seen from table (78) there is no statistically significant differences between the sexes in general intelligence as measured by the Cattell IPAT Scale 2 (total score). The difference is only 0.04 out of a possible 46 in favour of girls which is not significant. There are also no differences in the achievement scores, since these were normalized within schools. The girls were a little older than boys in this sample, but the difference was not statistically significant Both sexes are considered to be from families which are interested in music in the same degree since no significant differences were found according to the musicality of parents and siblings and their encouragement of the subjects. The socio-economic status of girl's families is higher than boys since the mean score of girls exceeded that of boys by 0.32 which is significant at

Table (78)

Differences between means for Boys and Girls in General Preparatory Schools

	Variables	Diff. Betw. Means	C.R.	Degree of Significance	Sig. in favour of Girls	Sig. in favour of Boys
1	Seashore Pitch	2.59*	1.87	Not Sig.		
2	Rhythm	1.41	2.17	Sig.at.05 lev.		✓
3	Time	3.50*	2.75	Sig.at.01 lev.		✓
4	Tonal Memory	4.10*	3.79	Sig.at.01 lev.		✓
5	Total	11.57*	4.41	Sig.at.01 lev.		✓
6	Bentley Pitch	4.93*	7.25	Sig.at.01 lev.		✓
7	Tonal Memory	2.08*	4.83	Sig.at.01 lev.		✓
8	Chord Analysis	1.24*	2.00	Sig.at.05 lev.		✓
9	Rhythmic Mem.	1.02*	3.00	Sig.at.01 lev.		✓
10	Total	8.98*	6.15	Sig.at.01 lev.		✓
11	Sadek Melody Ident.	0.63*	0.96	Not Sig.		
12	Rhythmic Ident.	2.20	2.39	Sig.at.02 lev.	✓	
13	Int. Rec. T	4.58*	6.36	Sig.at.01 lev.		✓
14	Int. Rec. O	0.98*	2.45	Sig.at.02 lev.		✓
15	Int. Rec. W	4.61*	7.55	Sig.at.01 lev.		✓
16	Cattell Series	0.17	0.40	Not Sig.		
17	Classif.	0.57	0.83	Not Sig.		
18	Matrices	0.10*	0.24	Not Sig.		
19	Conditions	0.81	2.25	Sig.at.05 lev.	✓	
20	Total	0.04	0.03	Not Sig.		
21	Achievement Arabic	0.12	0.30	Not Sig.		
22	Mathematic	0.11*	0.27	Not Sig.		
23	Performing	0.10*	0.25	Not Sig.		
24	Music Theory	0.10	0.24	Not Sig.		
25	Sight Singing	0.09*	0.22	Not Sig.		
26	Total	0.08*	0.05	Not Sig.		
27	Questionaire Age	0.09	0.24	Not Sig.		
28	Socio-Econ.Stat.	0.32	2.13	Sig.at.05 lev.	✓	
29	Deg. of Training	0.23*	1.53	Not Sig.		
30	Deg. of Int.	0.32	2.46	Sig.at 02 lev.	✓	
31	Musc. of Fath's	0.09	0.69	Not Sig.		
32	Musc. of Moth's	0.00	0.00	Not Sig.		
33	Musc. of Sibl.	0.44*	1.51	Not Sig.		
34	Musc. Activity	0.47*	1.24	Not Sig.		
35	Pref. of O.Prog	0.10	0.24	Not Sig.		
36	Pref. of W.Prog	0.59*	2.03	Sig.at.05 lev.		✓
37	Attending Con.	0.19	1.18	Not Sig.		
38	Leis. TimeAct.O	0.01	0.16	Not Sig.		
39	Leis. TimeAct.W	0.16	1.76	Not Sig.		
40	Family Encouragement	0.21	1.00	Not Sig.		

*=When difference between means is in favour of Boys

the .05 level. Girl's interest in music as measured by a 4-point self-rating scale is greater than that of boys since their mean score was higher by 0.32 which is significant at the .02 level. But boys proved to be more active as measured by the criterion of joining musical-bands in their schools but the difference between their mean score and that of girls ~~is~~, .47, is very small to be significant. Both boys and girls like to listen to oriental programmes to the same degree, but boys also like western programmes since their mean score exceeded that of girls by 0.59 which is significant at the .05 level. In their leisure time, both sexes played oriental music and western music and no significant differences were found. Although girls are of higher socio-economic status they do not attend concerts more frequently: the difference of 0.19 is not significant.

From the above discussion, it is clear that boys and girls could be considered from one population and if any superiority in musical ability tests occurs it is unlikely to be differences of background.

In the musical tests generally, boys were better than girls. Their superiority in each test is shown in table (78) and is discussed below.

In the Seashore test battery, the boys scored higher than girls on the Rhythm, Time, and Tonal Memory tests with differences in means of 1.41, 3.50 and 4.10; these were found to be statistically significant at the .05 level for the Rhythm test and at .01 level for the Time and Tonal Memory tests. They were superior too on the Pitch test, but the difference of 2.59 was not significant. This result confirms the statement given by Seashore in 1919 that no appreciable sex differences is found in this test. As far the other three tests, the results from the Rhythm test and the Time test confirm the opinion given by "competent musicians" who were asked by Farnsworth to predict sex differences for subjects when tested by the Seashore test battery. All but one declared that the girls should, on the average, score higher in pitch, memory and consonance". (Farbsworth 1931 p. 345). His explanation is the same as that offered by Smith (1914) who stated that boys tend to be brought up to regard music as girlish and so to be avoided. On the other hand, Farnsworth suggested that in respect of the Rhythm and Time tests boys seem to be "trained to be more self-reliant and so would necessarily have more experience in judging time and rhythm". (Farnsworth 1931). The first statement. though true of this sample is not confirmed by further analysis of sex differences in the case of the N.C. group. A possible explanation which would seem more logical is that sex differences will vary according to the methods of teaching used by several teachers in the classroom. A further analysis of the results of this study may confirm this statement.

In all the Bentley tests, the differences between the mean scores obtained by the two sex groups were found to be significant at the .05 or the .01 level in favour of boys. Bentley (1963) stated that when his test battery was used with 590 boys and 566 girls, the total mean score of girls exceeded that of boys by 0.8 only out of a possible 60.

In another study with 118 boys and 152 girls all aged 11, it was also found that the differences between the mean scores obtained were not significant either for the full test battery or for any individual test. He concludes that "there is no significant differences between the sexes in ability to do these tests". (1963, p. 145) In this study the difference of 8.98 out of a possible 60 in favour of boys was found to be significant at the .01 level. Again, the possible explanation for this superiority may be the methods used in teaching the boys.

In the Melody Identification test, the mean score of boys exceeded that of the girls by 0.63 out of a possible 30 which is not significant. The only test in which girls showed superiority was in the

Rhythmic Identification test. Their mean score exceed that of boys by 2.20 out of a possible 30, which is significant at the .02 level. Yet boys were superior in both the rhythm tests, i.e. Seashore's and Bentley's, which measure the ability to differentiate between two rhythmic patterns. The difference may arise because these two tests require retention of one pattern in mind while hearing the second, whereas in the Rhythmic Identification test, the rhythmic pattern to be judged is presented on the answer sheet. Alternatively it may be that girls are more familiar with rhythmic notation, due to the methods used by the teachers in their schools.

In the Interval Recognition test, boys performed better than girls in both parts. In the first part where only "Western" intervals were included in the test, the boys mean score exceeded the girls by 4.61 out of a possible 30, which is significant at the .01 level. In part 2 of the test where oriental intervals are included, the boy's mean score exceeded that of the girls by 0.98 out of a possible 10 which is significant at the .02 level. In both parts, the boy's superiority in pitch discrimination and memory may be involved.

Sex Differences within the National Conservatory Group.

This group consists of 74 subjects with age range between 9 to 15+. They have been highly selected for the study of music, and most of them have chosen music as their professional career. There are 45 girls and 29 boys who receive their music instruction in the National Conservatory but attend various schools for other subjects. The subjects are selected from different grades and the numbers from each grade have been mentioned in table (37) above.

From table (79) it is seen that their is no significant difference between the two sexes in general intelligence as measured either by the total score in Cattell IPAT Scale 2 or by any of the sub-tests. For the total score the difference is only 0.25 out of a possible 46 in favour of boys. It is also noticed that in the achievement scores in the individual subjects both sexes are nearly at the same standard and no statistical significance was found in any subject nor in the total score in which there was a difference of 0.85 out of a possible 50 in favour of boys. In this sample the girls were older than boys, and the difference between the mean ages of 2.63 half years was found to be significant at the .01 level. Because of this age factor, the girls' degree of training is

Table (79)

The Difference Between the Mean and its significance Within the Two Sex groups. N.C. Children

Se N	Veriables	Diff. Betw. Means	C.R.	Degree of Significance	Counted for	
					Girls	Boys
1	Seashore Pitch	0.47	0.18	Not Sig.		
2	Rhythm	0.06*	0.05	Not Sig.		
3	Time	1.69	1.09	Not Sig.		
4	Tonal Memory	0.34*	0.17	Not Sig.		
5	Total	1.88	0.35	Not Sig.		
6	Bentley Pitch	0.12*	0.085	Not Sig.		
7	Tonal Memory	1.00	1.45	Not Sig.		
8	Chord Analysis	0.79	0.80	Not Sig.		
9	Rhythmic Mem.	0.33	0.63	Not Sig.		
10	Total	1.66	0.61	Not Sig.		
11	Sadek Melody Ident.	2.33	2.28	Sig.at.05 lev.		/
12	Rhythmic Ident.	1.79*	1.37	Not Sig.		
13	Interval Rec.T	3.66	2.56	Sig.at.02 lev.		/
14	Interval Rec.O	1.81	4.20	Sig.at.01 lev.		/
15	Interval Rec.W	1.88	1.48	Not Sig.		
16	Cattell Series	0.24	0.32	Not Sig.		
17	Classif.	0.19*	0.33	Not Sig.		
18	Matrices	0.05*	0.07	Not Sig.		
19	Conditions	0.28	0.45	Not Sig.		
20	Total of Scores	0.25	0.11	Not Sig.		
21	Achievement Tests Arabic	0.08*	0.24	Not Sig.		
22	Mathematic	0.12	0.25	Not Sig.		
23	Performing	0.25	0.51	Not Sig.		
24	Music Theory	0.06	0.12	Not Sig.		
25	Sight Singing	0.35	0.70	Not Sig.		
26	Total	0.85	0.49	Not Sig.		
27	Questionaire Age	2.63*	2.99	Sig.at.01 lev.	/	
28	Socio-Econ. Stat.	0.15	0.25	Not Sig.		
29	Deg. of Training	0.77*	2.35	Sig.at.02 lev.	/	
30	Deg. of Tnt.	0.05	0.38	Not Sig.		
31	Musc. of Faths.	0.02*	0.07	Not Sig.		
32	Musc. of Moths.	0.58*	2.90	Sig.at.01 lev.	/	
33	Musc. of Sibl.	0.28*	0.47	Not Sig.		
34	Musical Activity	0.04*	0.26	Not Sig.		
35	Pref. of O. Prog.	0.19*	0.46	Not Sig.		
36	Pref. of W. Prog.	0.03	0.13	Not Sig.		
37	Attending Con.	0.27	1.17	Not Sig.		
38	Leis.Time Act.O	0.06	0.50	Not Sig.		
39	Leis.Time Act.W	0.16*	1.45	Not Sig.		
40	Family Encouragement	0.04*	0.36	Not Sig.		

* = When the mean score of girls is greater than that of boys.

superior to that of boys and the mean score of girls exceeded that of boys by 0.77 which is significant at the .02 level. Both sexes seemed to come from families which are interested in music to the same degree since the differences between the means obtained from the self-ratings of the parents and sibling's musicality and their encouragement of the subjects are not significant. The socio-economic status of the boy's families is higher than that of the girl's by 0.15 points, but this difference is not significant. There are some indications that this superiority in socio-economic status affects both the "attending concerts" and the "preference for Western music programs" since the boys mean scores in those two factors are superior to those of girls though the differences of 0.27 and 0.03 in favour of boys are not significant. The degree of interest in music for both sexes is nearly the same. The mean score of boys was greater than that of girls by 0.05 out of a possible 4 which is not significant. However any difference in interest does not seem to show itself in general musical activity since the mean score of girls in the interest factor was greater, while the boys mean score in general musical activity is greater. However in both factors, there are no statistical significance. Both boys and girls like to listen and play both oriental and western music in their leisure time, and the difference between the two sexes is not significant in these four self-ratings.

From the above discussion, it is clear that the two sex groups could be considered from one population, and if any superiority in musical ability tests occur , it is unlikely to be due to differences of background.

In the musical tests, boys were better than girls in the Pitch and Time tests in the Seashore battery and obtained a higher mean total score. They were also superior to girls in all the Bentley test battery except the pitch test. In the Identification tests boys were superior in the melody test while girls were superior in the rhythm test. Boys are superior in the recognition tests. The superiority of each group in each test is shown in table (79) and is discussed below.

1. The Seashore Test Battery In the Pitch test the difference between the mean score obtained by the two sex groups is 0.47 out of a possible 50 in favour of boys, which is not significant. In the Rhythm test the difference of 0.06 out of a possible 30 in favour of girls is not significant. In the Time test the boys were superior to girls, but the difference of 1.69 out of a possible 50 is not significant. In the Tonal Memory test the mean score of girls was greater than that of

boys, but the difference of 0.34 out of a possible 30 is not significant. In total scores on all the tests the boys obtained a mean score of 105.17 and the girls 103.29 out of a possible 160. The difference of 1.88 in favour of boys is not significant.

The results obtained from these tests confirms the statement given by Seashore and his colleagues (1960) who reported that "sex differences were found to be inconsistant from one level to another".

When these tests were used with the G.P.S. group, there was some indication of sex differences which were attributed to the differences in the methods used by the teachers. But in the N.C. they receive their music instruction from the same teachers in the same school, and the differences disappeared.

2. The Bentley Test Battery: The difference between the mean scores obtained by the two sex groups are 0.12, 1.00, 0.79, and 0.33, for the Pitch, Tonal Memory, Chord Analysis, and Rhythmic Memory respectively, none of which is significant. In all the tests except Pitch boys were superior to girls. In total score, boys obtained 32.24 and girls 30.58 out of a possible 60. The difference of 1.66 in favour of boys is not significant.

The results obtained from this group confirm the results obtained by Bentley (1963) who stated that "the difference between mean scores of boys and girls were not significant either for the full test battery or for any of the individual tests." (1963, p.92). These results also confirm the statement that the superiority of boys in the G.P.S. group is due to the methods of teaching used in this school.

3. The New Test:: In the Melody Identification test the mean score of boys was greater than that of girls. The difference of 2.33 out of a possible 30 is significant at the .05 level. The boy's superiority in this test may be connected with their superiority in sight singing, since their mean score in this subject is 4.55 while that of girls is 4.20.

In the Rhythmic Identification test, girls scored better than boys but the difference of 1.79 out of a possible 30 is not significant.

In both the Interval Recognition tests, boys performed better than girls and therefore obtained a higher mean score in the total test. The difference of 3.66 out of a possible 40 is significant at the .02 level. In part one, which included "Western" intervals only, the difference between the mean scores is 1.88 in favour of boys is not significant. But in part 2 which included "oriental" intervals which needed fine discriminations, the boy's superiority is significant at the .01 level. Although there were no significant differences in pitch discrimination and Tonal memory, it is possible that the slight superiority of boys may have helped them in the Interval Recognition tests.

To sum up, generally boys are better than girls in performing musical ability tests, but there are few significant sex differences, and those there are can probably be attributed to the methods employed by the music teachers in the different schools.